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1969

For:

The Montana Highway Commission, Planning Survey Section, The City of Great Falls, and the Great Falls City-County Planning Board.

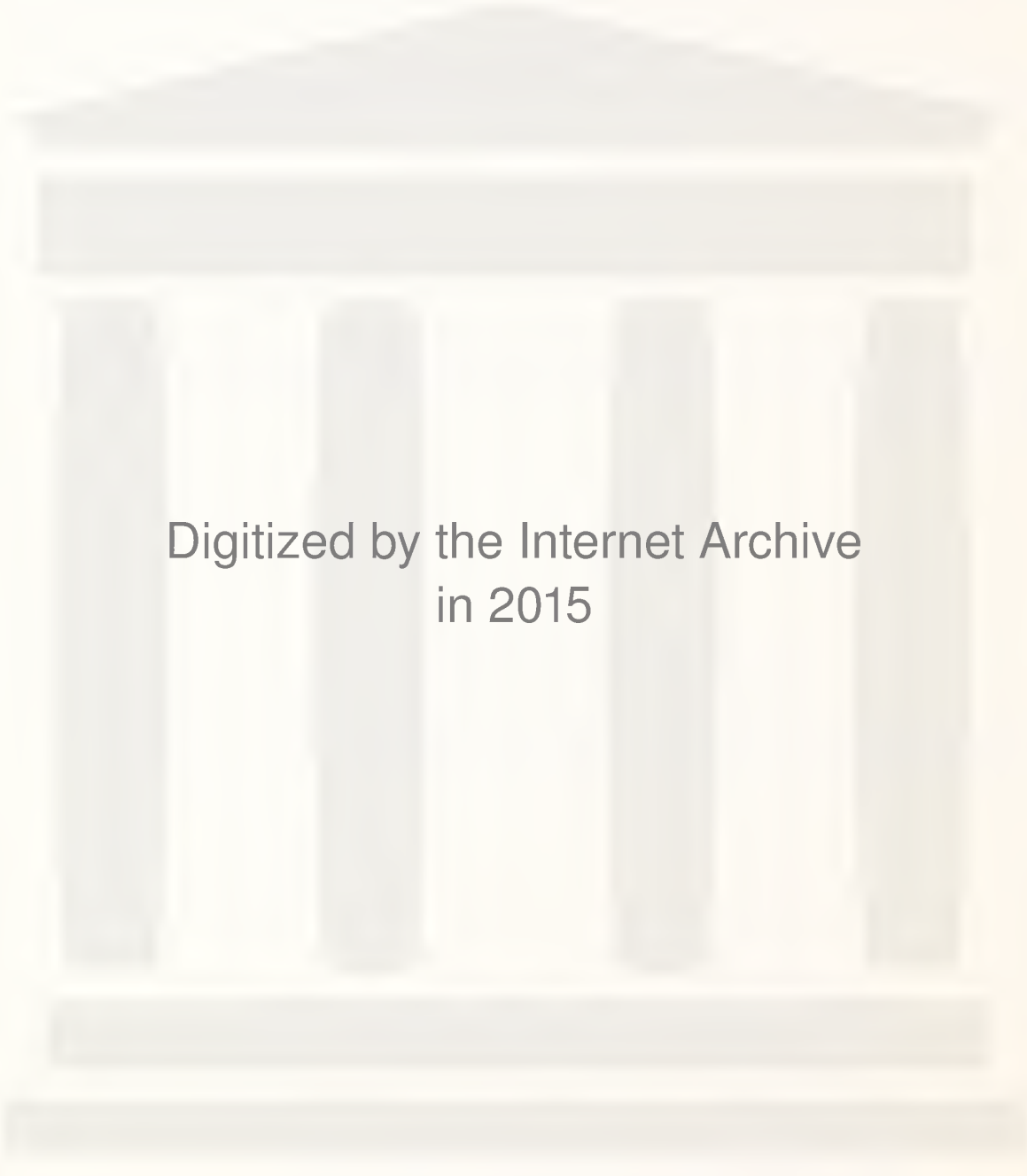
In Cooperation With:

The U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads.

By:

Small, Cooley and Associates, Inc.
Denver and Great Falls

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Bureau of Public Roads.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INTRODUCTION

CHAPTER 1

INTRODUCTION

GENERAL:

This report presents the first major review of a number of elements of transportation planning in the Great Falls area. This work was an "in depth" update of the 1961 Great Falls Urban Transportation Survey, conducted by the Montana State Highway Commission, Planning Survey Division, in cooperation with the U. S. Department of Commerce, Bureau of Public Roads, and the City of Great Falls.

Several of the major elements considered have been accomplished and updated by the Great Falls City-County Planning Board and have been published separately by that agency. These are marked (*) on the following list of the ten elements of transportation planning:

*1. Economic Factors Affecting Development;
*2. Population;
*3. Land Use;
4. Transportation Facilities;
5. Travel Patterns;
6. Terminal Facilities;
7. Traffic Control Features;
*8. Zoning Ordinances, Subdivision Regulations, etc.;
*9. Financial Resources; and
*10. Social and Community-Value Factors - e.g., parks and recreational facilities, preservation of historical sites, and esthetics.

Transportation planning has been established as a continuing process in Great Falls through the cooperative efforts of the City, Cascade County, the Montana State Highway Department and the U. S. Department of Transportation, Bureau of Public Roads.

The Comprehensive Plan developed by the Great Falls City-County Planning Board was used for land-use projections to 1990, and it is also being used by many local agencies in their work. This Plan will be kept up-to-date by the Planning Board and amended as required by unforeseen changes. It was with this understanding that the City, County, State, and Federal Governments authorized a joint cooperative effort to update the original Transportation Plan. Authorization for the Study was granted in July of 1967.

STUDY ORGANIZATION:

This Study was a cooperative effort between local, State, and Federal Governments. The responsibilities of each and the general

study organization are illustrated on the Organization Chart (shown on Exhibit 1).

REVIEW OF 1961 PLAN:

The original Urban Transportation Survey, its findings and recommendations, was based on comprehensive travel data and inventories for the year 1961. Future travel demand was predicted to the year 1981, based on travel characteristics from the 1961 data and land use and socio-economic projections through the forecast year.

Specific recommendations were made for improving the major street network and terminal facilities to meet 1981 demands. The recommended improvements were scheduled by stage construction with the first series of improvements to be completed between 1965 and 1970.

Of these improvements, most are complete and in service and some are in the advanced stages of planning and are in effect committed to the network. Lack of financing has delayed some important projects, for example the Warden Bridge expansion to four lanes. Chapter 11 of this report will explain in detail how the various recommendations fit the overall current conditions and what changes should be made in the long-range plan through the year 1990.

GROWTH TRENDS:

Several indications of continued growth in the Great Falls Metropolitan Area are evident from 1961 to date. County motor vehicle registrations show a 32 percent increase, traffic crossing the Missouri River has increased 23.4 percent, external and internal travel have increased by 41.5 percent and 33.9 percent, respectively. The major arterial streets have shown a sizable increase in traffic volumes, most noticeably 10th Avenue South.

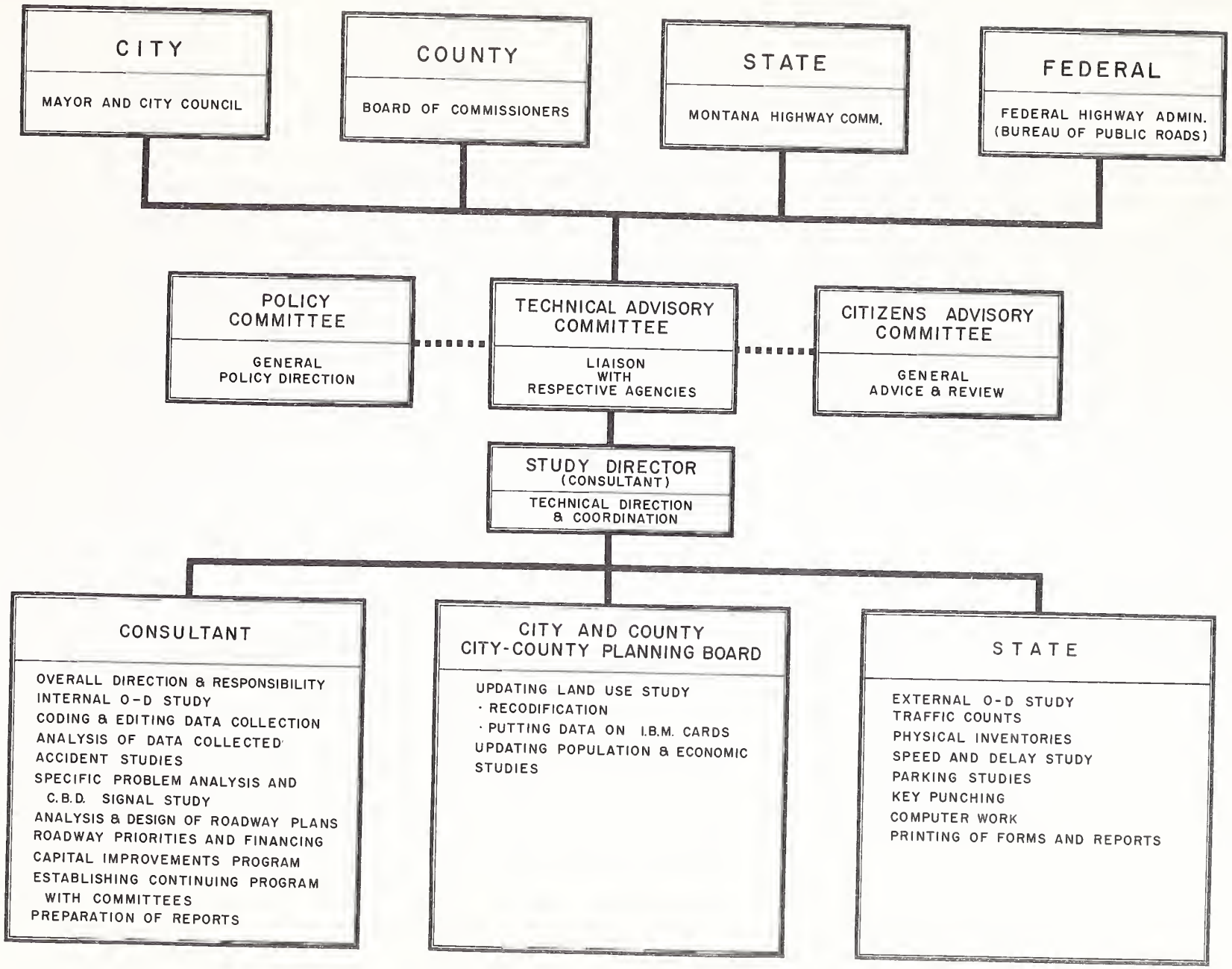
STUDY AREA:

The Study Area was selected with the assistance of the Planning Board Staff and encloses the areas expected to be part of the Great Falls Urban Area by the design year of 1990.

The area has been expanded from the 1961 Study to include additional areas north, south, and west of the original cordon line. Development in the Riverview Area had by 1967 reached the original cordon boundary on the north. It is expected that growth will continue in this area, and therefore the cordon line was moved outward one mile to include an additional three square miles of area within the cordon boundary.

EXHIBIT 1

RELATIONSHIP & RESPONSIBILITIES OF PARTICIPATING AGENCIES



The West Great Falls, or Lower Sun River, area was expanded to include the lands to be protected by the West Great Falls Flood Control and Drainage District, formed after the disastrous 1964 flood. In the past, development of this area has been questionable because of periodic floods. It now appears that the flood project will be a reality, and when it is completed, will open up protected new areas to potential residential, commercial and industrial development.

The southern boundary has been extended to include the Donovan Park-Irish Acres area east of the Missouri River, as well as the area south of the Grande Vista Subdivision along the west bank of the Missouri River. A great potential for suburban development in this area exists and can be expected to occur when the City is able to provide the necessary transportation facilities and the utilities. Also added to the Study Area is the Great Falls International Airport, located at the top of Gore Hill. Air traffic has increased at an unprecedented rate in the past five years, and within the next two decades the airport can be expected to become a major traffic generator.

The Study Area, as delineated by the external cordon line (shown on Exhibit 2), encompasses 31,500 acres compared to approximately 20,000 acres within the 1961 Study Area. Included within the area are approximately 23,500 dwelling units and a population of approximately 78,700. The City-County Planning Board has projected growth to 120,700 persons within the Study Area by 1990.

OBJECTIVES:

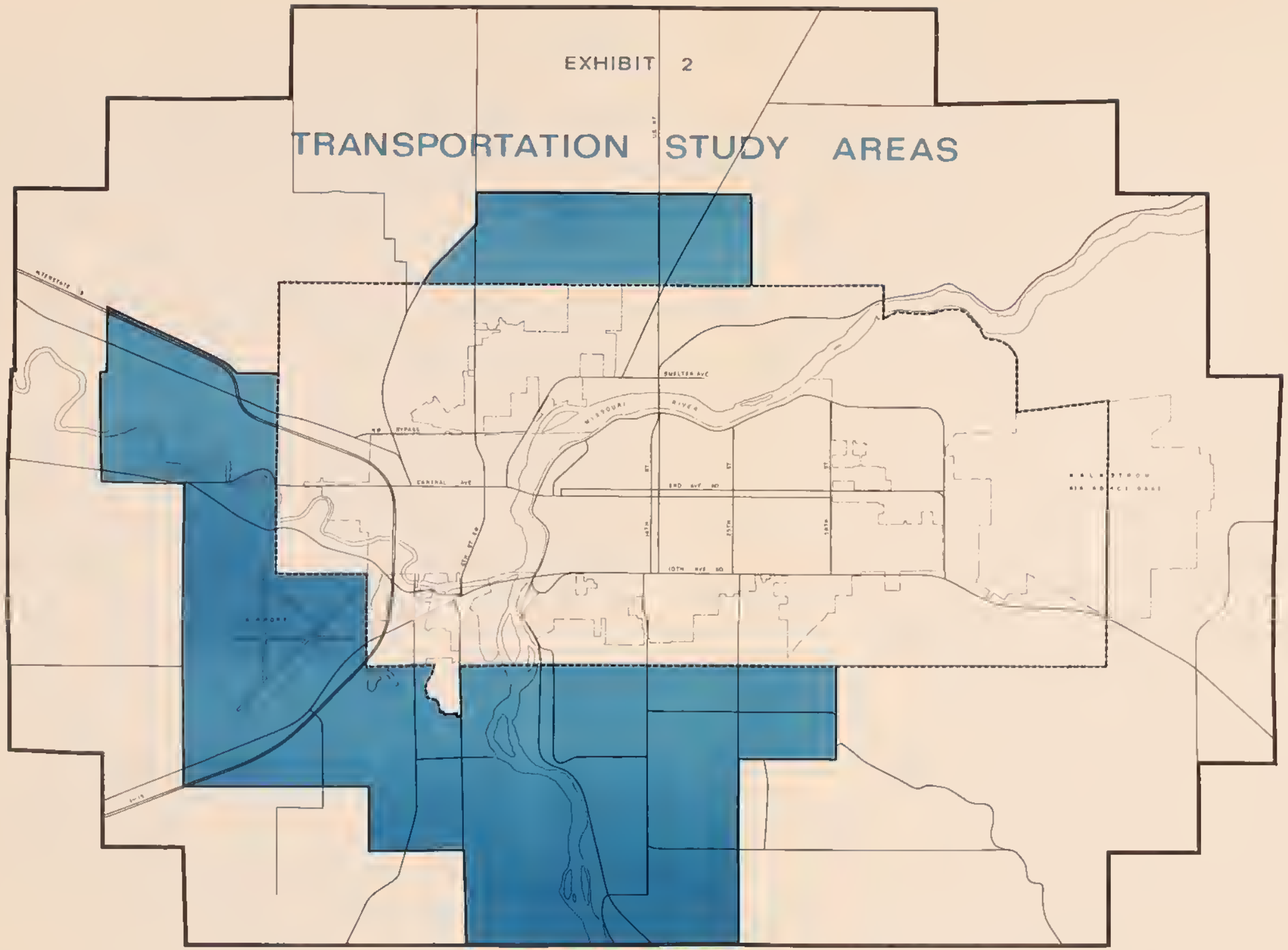
The main objectives of this Study were to analyze and update the previous Transportation Survey, as well as other comprehensive planning conducted during the interim years within the Study Area. New recommendations have been prepared for the development of a balanced transportation system for the Great Falls Metropolitan Area through the year 1990.

In general, the principal goals of the plan are:

1. To combine transportation planning with comprehensive area-wide planning that is periodically updated;
2. To provide a recommended plan that will have flexibility, and will accommodate new travel demands based on area growth; and
3. To provide a schedule of improvements programmed on the basis of need, cost and ability to finance by the various responsible agencies.

EXHIBIT 2

TRANSPORTATION STUDY AREAS



PLANNING BOARD BOUNDARY
GREAT FALLS CITY LIMITS

1961 TRANSPORTATION STUDY
AREAS ADDED FOR 1968 UPDATE

SCALE

N

PLANNING - A CONTINUING PROCESS:

Perhaps the single-most important recommendation with regard to this Transportation Plan and the Comprehensive Plan is that they be kept up-to-date. These plans should not be considered perfect or fixed. They should be continually updated to reflect the current thinking of City, County and State agencies concerned with the development of Great Falls, as well as the School District, private industry, developers and many others. In summary, the plans should become "working tools" that are always available for reference and use. This procedure will greatly facilitate the continuing updating and review procedures in the Transportation Study process.

As time goes by, new and improved techniques will become available in transportation planning and land use planning. These should be incorporated wherever possible. Also, the fine spirit of cooperation in the planning process that is presently evident among City, County, State and other agencies must be continued.

POTENTIAL BENEFITS:

The recommendations for improvement of transportation facilities in the Great Falls Metropolitan Area represents a substantial investment in public funds. However, this investment can be expected to yield much greater benefits in time and money saved, as well as greater convenience and safety for the traveling public. As population and employment increase, there will also be increases in demand for all types of public facilities and services such as schools, sewer and water systems, parks and recreation areas and airport improvements. In order for the community to fully realize the benefits of other capital improvements, it is essential that transportation facilities be provided for the efficient and economical movement of people and goods with expedience and safety.

The following benefits will be derived from the Great Falls Transportation Plan as it is coordinated with the Comprehensive Plan:

1. Maximum utilization of existing facilities;
2. Development of new facilities to complement existing routes;
3. Recognition of the future demands relative to potential growth areas;
4. Establishment of a logical priority program for capital improvements;
5. Assurance of major route continuity; and
6. Provision of a guide for orderly growth and development of all sections of the Metropolitan Area.

SURVEYS

&

TRAVEL CHARACTERISTICS

CHAPTER 2

ORIGIN AND DESTINATION SURVEYS

GENERAL:

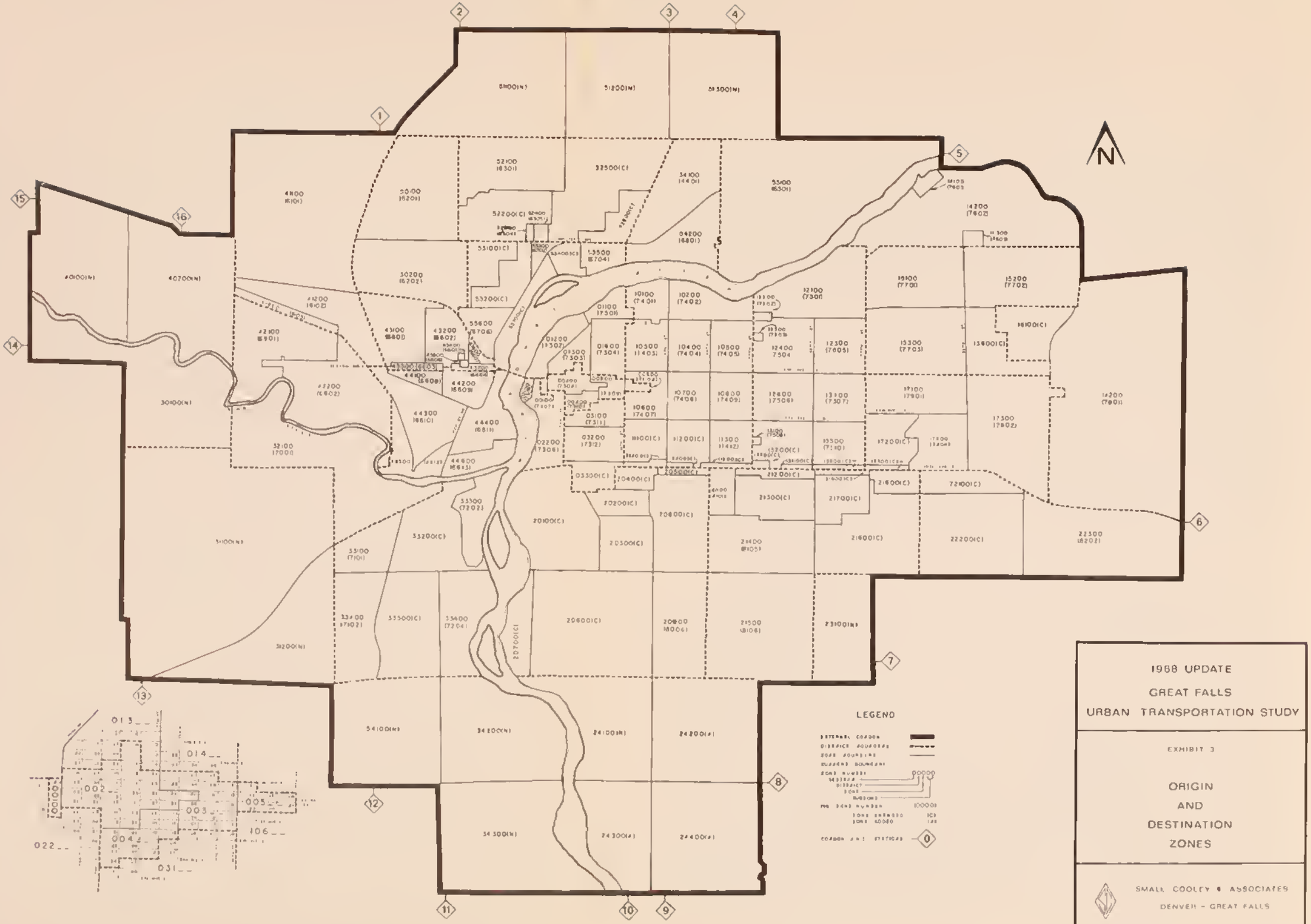
In the continuing transportation planning process, a great many facts are required about the present travel characteristics of the area to be studied, as well as about the physical characteristics of the transportation system. Since this report represents an update of the 1961 Survey, much of the information needed had already been compiled. However, in order to ascertain changing trends or characteristics for comparative purposes, current information was required. Future information will be gathered on a continuing basis, and reviewed for correlation with projections made in this Study.

ORIGIN AND DESTINATION ZONES:

The 1961 Study Area was first analyzed to determine what changes would be required to meet existing conditions in 1968. This analysis indicated a need for revision in some zone boundaries. Of most consequence were the changes occurring along the 10th Avenue South commercial complex. For example, the Holiday Village Shopping Center had expanded during the years 1961 to 1967 to such an extent that it overlapped the boundaries of its original origin and destination zone. Throughout the Study Area, current land use maps were reviewed, and appropriate zone changes were made if required to allow grouping of homogenous land use types within the confines of individual origin and destination zones. Except for the 10th Avenue South commercial complex, such zone changes were minor.

Exhibit 3 shows the 1968 zone boundaries and the five-digit number assigned to each zone. The 1961 Survey four-digit number appears in parentheses within the same zone where no change was made. For zones requiring a boundary change, a "C" after the new zone number denotes that the old zone has been changed. In the latter cases, only the new five-digit number appears. An "N" indicates that the zone was added to the Study Area for the 1968 Study.

In assigning zone numbers the Study Area was first divided into six separate sections radiating outward from the Central Business District. Section 0 is bounded on the west and north by the Missouri River, on the east by 10th Street, and on the south by 10th Avenue South. Section 1 includes all land lying east of 10th Street, south of the Missouri River, and north of 10th Avenue South, including Malmstrom Air Force Base. Section 2 includes all land south of 10th Avenue South and east of the Missouri River. Section 3 includes all those lands within the Study Area lying west of the Missouri River and south of the Sun River. Section 4 is the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LEGEND
1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY
EXHIBIT 3
ORIGIN
AND
DESTINATION
ZONES
SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS

area bounded on the south by the Sun River, on the north and east by the Watson Coulee Road and the Chicago, Milwaukee and St. Paul Railroad Company's Agwam Line, and on the east by the Missouri River.

The sections were then subdivided into analysis districts which are designated by the second digit in the zone number. These districts were further subdivided into the origin and destination zones, indicated by digit number three in the zone number. A further subdivision of the origin and destination zone was accomplished by subzoning, indicated by digits four and five in the zone number. Subzones were utilized in the Central Business District for parking analyses. Future update studies, however, may utilize the subzones to delineate specific land use changes within origin and destination zones without requiring additional zone boundary changes.

Section, district and zone boundaries have been drawn to agree as closely as possible to other statistical area designations being used by the Great Falls City-County Planning Board. These include such analysis units as Census Tracts and Neighborhood Units. This has been done to eliminate future duplications of effort in compiling statistics on population, dwelling unit counts, and land use data summaries used by the Planning Board for other planning purposes.

In summary, the new Study Area is made up of six sections containing 55 districts and 135 origin and destination zones.

EXTERNAL ORIGIN AND DESTINATION SURVEY:

A total of 16 external stations was selected and located, as shown on Exhibit 3. The station numbers are similar to those of 1961, with the exception of Station No. 16, which was assigned to the recently completed Interstate 15 at Emerson Junction. Locations were adjusted to coincide with the updated cordon boundary.

Machine counts were made at all 16 external stations for a seven-day period during August of 1967. From the machine counts, it was determined that 96% of all vehicles crossing the external cordon could be accounted for at nine of the 16 stations.

Roadside interviews were conducted for outbound traffic at these nine selected stations. Each station was operated for one day between the hours of 6:00 A.M. to 9:00 P.M. on weekdays between August 15 and August 24, 1967. A summary of the external interviews is shown as Table No. 1.

Total external vehicle cordon crossings in both directions totaled 19,184 on an average weekday in August of 1967. This compares with 20,716 vehicle crossings on the average weekday in 1961.

The decrease of 1,532 crossings does not reflect an overall travel decrease for external traffic. It is a result of the cordon relocation. Many external trips that originated within the 1961 Study Area now terminate within the new Study Area. Machine counts show that 1967 average daily traffic crossing the 1961 Boundary in 1967 totaled 22,499.

Cordon relocation primarily affected traffic crossing at Stations No. 7, 8, 9, 10, 11, 12 and 13, all located on the southern boundary and including all Airport traffic.

It should be noted that the External Survey of 1967 was conducted during a strike at the Anaconda operations in Great Falls. There undoubtedly was some effect on 1967 external travel caused by the strike. However, tourist travel was at its peak during this period, and was considered of more consequence than the strike when related to external travel.

Trip data were obtained from 6,290 outbound vehicles or 88% of the 7,138 vehicles manually counted at the nine operating external stations for the 15-hour period.

Through Trips without intermediate stops totaled 1,138 in 1968 compared to 932 in 1961. Through trips with intermediate stops were divided into two trips. The first trip was produced at the station of entry and attracted to the intermediate stop destination. The second was produced at the intermediate stop and recorded at the external station as an external trip. This was the same method utilized in the 1961 Study.

TAXI SURVEY:

The movement of all of the 25 taxis operating in the Great Falls area was recorded using drivers' trip logs which were secured from the three local taxi companies. Data obtained consisted of dates of travel, origin and destination addresses, and mid-point times for each taxi over a representative 24-hour period.

The taxi interview data showed a total of 1,643 trips which represents a daily average of 65.7 trips per vehicle. This compares to a 1961 total of 2,230 taxi trips, averaging 97 trips per vehicle.

INTERNAL ORIGIN AND DESTINATION SURVEY:

By far the major portion of all travel takes place completely within the Study Area. The characteristics of this travel can best be documented by interviewing individual households within the area. It is not economically practical to interview every household and it has been shown in other studies that if a representative sample of households is interviewed, the data obtained therefrom can

TABLE NO. 1

SUMMARY OF

1967 EXTERNAL INTERVIEWS

Station No.	August Average Week-Day Traffic	Manual Count During Interview (Both Dir.)	Percent Trucks	Outbound Car Count	Outbound Cars Interviewed	Outbound Truck Count During Interview	Outbound Trucks Interviewed	Sampling Rates (Percent) 15-Hr. Cars Outbound	15-Hr. Trucks Outbound	15-Hr. Total Outbound	24-Hr. In and Outbound	No. of Void Interviews
1	78			Not Interviewed								
2	85			Not Interviewed								
3	521	340	55%	75	73	90	84	97%	93%	95%	41%	0
4	2,702	1,956	27	742	678	274	248	91	91	91	40	3
5	192			Not Interviewed								
6	4,381	3,350	25	1,259	1,168	419	370	94	89	92	40	1
7	78			Not Interviewed								
8	225	51	20	16	16	4	4	100	100	100	16	0
9	347	248	48	63	59	57	56	94	98	96	40	1
10	262	116	39	37	36	24	24	97	100	98	43	
11	81			Not Interviewed								
12	182			Not Interviewed								
13	3,711	2,728	25	1,081	961	354	317	89	90	89	36	11
14	89			Not Interviewed								
15	617	427	55	96	95	119	114	99	96	97	43	0
16	5,633	4,370	29	1,733	1,470	695	517	85	74	81	38	22
All Interview Stations												
	18,399	13,586	29%	5,102	4,556	2,036	1,734	90%	85%	88%	40%	38
All Stations												
	19,184											

Note 1: The Stations interviewed comprised 96% of all cordon crossings.
Note 2: 0.6% of all interviews had to be voided.
Note 3: Trucks do not include pickups or panels.

safely be taken as an indicator of total traffic within the area.

In this Update Study a sampling rate of 5%, or 1 in 20 households, was interviewed within the original Study Area and a 20% sample, or 1 out of each 5 households, was interviewed in the expanded Study Area.

On this basis, a total of 1,351 samples was selected. Of these, 125 were in the expanded areas, 1,225 were in the original Study Area, and one was excluded because it was determined to be outside of the Study Area.

Utility company records were the main source used in the sample selection. These records were complete and are kept up-to-date monthly. Other sources of information used in the sample selection process included city directories, aerial photos, city maps and field inspection. In addition, information which the City-County Planning Board had already compiled on multiple-family dwelling units was also utilized. Special land uses such as Malmstrom Air Force Base, Parkdale housing and Boeing installations, provided separate records for sample selection.

After the samples had been selected, they were arranged in a master sample listing from 1 through 1,351. The next step consisted of hiring and training interviewers to conduct the actual survey. Because of time and cost considerations it was decided to utilize telephone interviews in gathering as much of the information as possible. The local news media provided a great deal of public service time in advance of the actual survey to alert the Great Falls residents concerning the project. In addition, pre-interview letters were sent to each of the sample households in advance of the interview date with all the necessary data and forms for recording the data for a specific travel date. (Copies of the forms used in the survey are shown on the following pages.) The pre-survey publicity, coupled with the pre-interview contact, aided in making the telephone survey a very successful method of data collection. A summary of results appears in Table No. 2.

In Table No. 3 are found comparisons of Internal Origin and Destination data with Land Use data collected by the Great Falls City-County Planning Board.

JOHN J. McLAUGHLIN, Mayor

City of GREAT FALLS Montana 59401

TELEPHONE 406/ 452-8561

CITY CLERK
Fred L. Hill

CITY ATTORNEY
William Conklin

ALDERMEN

First Ward
J. B. Austin
Mrs. John Nelson Hall

Second Ward
Joe Bauer
Robert F. Carter

Third Ward
Fritz Norby
Wm. H. Pardis

Fourth Ward
Dominic Fontana
Clarence J. Bartell

Fifth Ward
Vince Kerouac
Helen G. O'Connell

Dear Citizen:

The Great Falls City-County Planning Board, in cooperation with the Montana Highway Commission and the Bureau of Public Roads, is in the process of preparing a comprehensive plan to guide the future development of roadways in the Great Falls area. Your household has been selected on a random basis for the purpose of obtaining current information on daily travel within the area. What this will mean to you, as a citizen, is a better community served by improved streets and highways.

Sometime between the hours of 9:00 A.M. and 9:00 P.M., within two days after the date given below, an interviewer will contact you by telephone or in person. After identifying herself she will ask you questions pertaining to travel by members of your family on that travel date. Your answers will be treated confidentially.

Enclosed is a set of travel log forms. Directions for their use are printed on the back of each form. It would be very helpful, and will reduce the interview time required, if you will log all travel for the travel date prior to the interview.

Your cooperation in furnishing the information requested by the interviewer will be greatly appreciated.

If you have any questions, please call 452-6711.

Very truly yours,

John J. McLaughlin

JOHN J. McLAUGHLIN, Mayor
City of Great Falls

_____
TRAVEL DATE

W. Earl Hasbrouck

W. EARL HASBROUCK, President
Great Falls City-County Planning Board

GREAT FALLS URBAN TRANSPORTATION STUDY

TRAVEL LOG for all trips made by_____
(Name of Driver)

During the 24-hour period of_____
(Travel Date)

(For Instructions See Back)

TRIP NO.	WHERE DID TRIP BEGIN?	TIME BEGAN	WHERE DID TRIP END?	TIME ENDED	NO. OF PEOPLE IN VEH.
1	From	AM PM	To	AM PM	
2	From	AM PM	To	AM PM	
3	From	AM PM	To	AM PM	
4	From	AM PM	To	AM PM	
5	From	AM PM	To	AM PM	
6	From	AM PM	To	AM PM	
7	From	AM PM	To	AM PM	
8	From	AM PM	To	AM PM	
9	From	AM PM	To	AM PM	
10	From	AM PM	To	AM PM	
11	From	AM PM	To	AM PM	
12	From	AM PM	To	AM PM	
13	From	AM PM	To	AM PM	
14	From	AM PM	To	AM PM	
15	From	AM PM	To	AM PM	
16	From	AM PM	To	AM PM	
17	From	AM PM	To	AM PM	
18	From	AM PM	To	AM PM	
19	From	AM PM	To	AM PM	
20	From	AM PM	To	AM PM	

WHAT IS THIS STUDY ALL ABOUT?

The purpose of this Transportation Study is to determine existing and future street and highway needs in the Great Falls area. To do this, vehicle trip information is being gathered in three ways: (1) by interviewing motorists at roadside locations, (2) by interviewing families who live in the study area, and (3) by interviewing the owners of trucks and taxis which are based within the area. The information obtained from these interviews permits careful planning of streets and highways to help meet your transportation needs.

WHAT INFORMATION IS DESIRED?

In order for the vehicle trip information to be usable, it must be complete. Therefore, we need a list of all of the trips made by each member of your family who drives any vehicle on the designated travel date. For each trip we need to know: (1) where the trip began, (2) the time it started, (3) where the trip ended, (4) the time it ended, and (5) the number of persons in the vehicle. Any trip made in a vehicle not driven by a member of your household need not be reported.

HOW TO USE YOUR TRAVEL LOG.

For your convenience we have provided you with several travel logs. It would be desirable if each driver of your household would complete a separate log of his or her trips. If a sufficient number of travel logs has not been enclosed, please use blank sheets of paper. Please do not mail your travel logs, but have them close by the telephone on the day following the travel date. Your interviewer, who will call either by phone or in person, is trained to record the desired information quickly.

WHAT IS A TRIP?

A trip has a start and an end with no important stops between. Usually, at the end of a trip, either the driver or a passenger gets out of the vehicle. A trip could end, however, at a drive-in bank, drive-in restaurant, drive-in theatre, a post office mailbox, or even a service station, with no one actually getting out of the vehicle. If a trip is strictly for pleasure, the farthest point traveled to and possibly several major points along the way should be recorded.

The trips made by a typical family on a normal weekday might be as follows:

Trip No.	Trip Began	Time	Trip Ended	Time	Number of People in The Vehicle
1	Home Address	8:30 A.M.	School Name	8:45 A.M.	3
2	School Name	8:45 A.M.	Work Address	9:00 A.M.	1
3	Work Address	5:00 P.M.	1210-10th Ave. So.	5:15 P.M.	1
4	1210-10th Ave. So.	5:30 P.M.	Home Address	5:45 P.M.	1

The trips shown here are only examples used to illustrate the proper use of the travel log. In reality, there is no typical family, and the number and purpose of trips can vary widely. Our concern is not with trips you would normally make, but only with those that you happen to make on the designated travel day.

Your assistance and cooperation are deeply appreciated. If you have any questions, or if we can assist you in any way with the travel log, please call us at 452-6711.

GREAT FALLS URBAN TRANSPORTATION STUDY

DWELLING UNIT SUMMARY

ADMINISTRATIVE RECORD

INTERVIEWER _____

CALLS

	Date	Time
(1)		
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		
(9)		

NOTES

REPORT SUBMITTED

Date _____ Initials _____

If incomplete, give reason _____

SUPERVISOR'S COMMENTS

INTERVIEW CHECKED BY _____ (initials)

CODED BY _____ (initials)

CODING CHECKED BY _____ (initials)

Interview ADDRESS

PHONE DATE of Travel

Number of DWELLING UNITS in this Building

CARD NUMBER 1 | 1

TRACT NUMBER 2 3 4

ROUTE NUMBER 5 6 7

SAMPLE NUMBER 8 9 10 11

ZONE NUMBER 12 13 14 15 16

MONTH and DAY 17 18 19

A. STRUCTURE TYPE

1. Single Family
2. Two Family
3. 3-4 Family Apt
4. 5 + Family Apt
5. Rooming House
6. Hotel
7. Motel
8. Institution
9. Trailer
0. Mixed

Structure Type Code 20

B (1). Number of AUTOS (include company owned) 21 22

B (2). Number of TRUCKS not used commercially 23 24

C. Number of PERSONS residing at this address 25 26

D. Number of PERSONS 5 years of age OR OVER residing at this address

E. * Person Number	Age	Sex	(List all persons 5 or over) Person Identification	Code	Occupation and Industry	Drive? Yes	Drive? No	Trips? Yes	Trips? No
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
91-99			Visitors with trips						

* Circle Person Number if interviewed

F (1). Number of AUTO TRIPS reported at this address 27 28 29 30

F (2). Number of NON-COMMERCIAL TRUCK TRIPS

G. Number of DRIVERS WITH AUTO TRIPS reported 31 32

H. Number of DRIVERS WITH NO AUTO TRIPS reported 33 34

I. Number of DRIVERS WITH UNKNOWN AUTO TRIPS 35

J. AUXILIARY INFORMATION

(To be completed after the interview)

1. Number EMPLOYED 36 37
2. Number of STUDENTS 38 39
3. Number of HOME BASED WORK AUTO TRIPS 40 41
4. Number of HOME BASED OTHER AUTO TRIPS 42 43
5. Total number of HOME BASED AUTO TRIPS 44 45

6 (a) Residential ACRES per D.U. 46 47 48

(b) PERSONS per Residential ACRE 49 50 51

(c) HOME VALUE (in thousands of dollars) 52 53

(d) TRAVEL TIME to CBD 54 55 56

(e) MILES to CBD 57 58

K. FACTOR 59 60 61

SMALL, COOLEY AND ASSOCIATES

INTERNAL TRIP REPORT

CARD NUMBER 2 SAMPLE NUMBER _____ ZONE NUMBER _____ MONTH and DAY of TRAVEL _____ Page _____ of _____

1	2	3	4	5	6	7	8	9	10	11	12
OCCUP. and INDUS.	PERSON NUMBER	TRIP NUMBER	SEX	ORIGIN WHERE DID THIS TRIP BEGIN?	DESTINATION WHERE DID THIS TRIP END?	TYPE OF VEHICLE	TIME AT START / END	FROM / PURPOSE OF TRIP / TO	NUMBER IN AUTO	TYPE OF PARKING AT DESTINATION	BLOCKS WALKED
			1 M 2 F	Address Land Use Zone L.U.	Address Land Use Zone L.U.	1 Auto 2 Non-Comm. Trucks	A.M. / A.M. P.M. / P.M.	1 WORK 1 2 PERSONAL BUSINESS 2 3 MEDICAL-DENTAL 3 4 SCHOOL 4 5 SOCIAL-RECREATION 5 6 CHANGE TRAVEL MODE 6 7 EAT MEAL 7 8 SHOPPING 8 9 SERVE PASSENGER 9 0 HOME 0	1 2 3 4 5 6 7 8 9 OR MORE	1 STREET FREE 2 STREET METERED 3 LOT FREE 4 LOT PAID 5 GARAGE FREE 6 GARAGE PAID 7 SERVICE-REPAIRS 8 RES. PROPERTY 9 CRUISED 0 NOT PARKED	1 0 2 3 4 5 6 7 8 9 OR MORE
			1 M 2 F	Address Land Use Zone L.U.	Address Land Use Zone L.U.	1 Auto 2 Non-Comm. Trucks	A.M. / A.M. P.M. / P.M.	1 WORK 1 2 PERSONAL BUSINESS 2 3 MEDICAL-DENTAL 3 4 SCHOOL 4 5 SOCIAL-RECREATION 5 6 CHANGE TRAVEL MODE 6 7 EAT MEAL 7 8 SHOPPING 8 9 SERVE PASSENGER 9 0 HOME 0	1 2 3 4 5 6 7 8 9 OR MORE	1 STREET FREE 2 STREET METERED 3 LOT FREE 4 LOT PAID 5 GARAGE FREE 6 GARAGE PAID 7 SERVICE-REPAIRS 8 RES. PROPERTY 9 CRUISED 0 NOT PARKED	1 0 2 3 4 5 6 7 8 9 OR MORE
			1 M 2 F	Address Land Use Zone L.U.	Address Land Use Zone L.U.	1 Auto 2 Non-Comm. Trucks	A.M. / A.M. P.M. / P.M.	1 WORK 1 2 PERSONAL BUSINESS 2 3 MEDICAL-DENTAL 3 4 SCHOOL 4 5 SOCIAL-RECREATION 5 6 CHANGE TRAVEL MODE 6 7 EAT MEAL 7 8 SHOPPING 8 9 SERVE PASSENGER 9 0 HOME 0	1 2 3 4 5 6 7 8 9 OR MORE	1 STREET FREE 2 STREET METERED 3 LOT FREE 4 LOT PAID 5 GARAGE FREE 6 GARAGE PAID 7 SERVICE-REPAIRS 8 RES. PROPERTY 9 CRUISED 0 NOT PARKED	1 0 2 3 4 5 6 7 8 9 OR MORE
			1 M 2 F	Address Land Use Zone L.U.	Address Land Use Zone L.U.	1 Auto 2 Non-Comm. Trucks	A.M. / A.M. P.M. / P.M.	1 WORK 1 2 PERSONAL BUSINESS 2 3 MEDICAL-DENTAL 3 4 SCHOOL 4 5 SOCIAL-RECREATION 5 6 CHANGE TRAVEL MODE 6 7 EAT MEAL 7 8 SHOPPING 8 9 SERVE PASSENGER 9 0 HOME 0	1 2 3 4 5 6 7 8 9 OR MORE	1 STREET FREE 2 STREET METERED 3 LOT FREE 4 LOT PAID 5 GARAGE FREE 6 GARAGE PAID 7 SERVICE-REPAIRS 8 RES. PROPERTY 9 CRUISED 0 NOT PARKED	1 0 2 3 4 5 6 7 8 9 OR MORE
			1 M 2 F	Address Land Use Zone L.U.	Address Land Use Zone L.U.	1 Auto 2 Non-Comm. Trucks	A.M. / A.M. P.M. / P.M.	1 WORK 1 2 PERSONAL BUSINESS 2 3 MEDICAL-DENTAL 3 4 SCHOOL 4 5 SOCIAL-RECREATION 5 6 CHANGE TRAVEL MODE 6 7 EAT MEAL 7 8 SHOPPING 8 9 SERVE PASSENGER 9 0 HOME 0	1 2 3 4 5 6 7 8 9 OR MORE	1 STREET FREE 2 STREET METERED 3 LOT FREE 4 LOT PAID 5 GARAGE FREE 6 GARAGE PAID 7 SERVICE-REPAIRS 8 RES. PROPERTY 9 CRUISED 0 NOT PARKED	1 0 2 3 4 5 6 7 8 9 OR MORE

SMALL, COOLEY AND ASSOCIATES

TABLE NO. 2

INTERNAL ORIGIN AND DESTINATION SURVEY RESULTS

Description	Sample Results	Percent Of Total
Completed Interviews	1,250	92.6%
Vacant Dwellings	84	6.2%
No Contacts	14	1.0%
Refusals	2	0.2%
Total Dwelling Units Processed	1,350	100.0%
Auto Trips Reported	7,000	90.5%
*Non Commercial Truck Trips Reported	737	9.5%
Total Trips Reported	7,737	100.0%
Reported Auto Trips Per Dwelling Unit (Completed Interviews)	5.60	
Auto Trips Per Dwelling Unit (Including Vacant Dwellings, but Excluding No Contacts and Refusals)	5.25	
*Reported Non Commercial Truck Trips Per Dwelling Unit (Completed Interviews)	0.59	
*Reported Non Commercial Truck Trips Per Dwelling Unit (Including Vacant Dwellings, but Excluding No Contacts and Refusals)	0.55	
Total Trips Per Dwelling Unit (Completed Interviews)	6.19	
Total Trips Per Dwelling Unit (Including Vacant Dwellings, But Excluding No Contacts and Refusals)	5.80	
Samples Which Required Field Interview (Percent of Total Samples)	155	11.5%
Samples Which Made Trips (Percent of all Completed Interviews)	937	75.0%

*Non commercial trucks were defined as pickups and panels and other light trucks used primarily as autos for personal transportation.

TABLE NO. 3

COMPARISON OF LAND USE AND EXPANDED
ORIGIN & DESTINATION SURVEY DATA

Description	1968 Land Use	1968 O & D
Statistics Common to Both Land Use and O & D Surveys		
Total Persons	78,844	75,466
Total Students	23,585	23,377
Labor Force	31,008	28,655
Total Dwelling Units	23,354 1/	25,352
Total Occupied Dwelling Units	22,861 1/	24,080
Vacant Dwelling Units	493	1,272 2/
Persons per Occupied Dwelling Unit	3.45	3.13
Students per Occupied Dwelling Unit	1.03	.97
Statistics Gathered Only from O & D Survey		
Number of Autos		30,501
Autos per Occupied Dwelling Unit		1.27
Persons 5 Years Old or Older		67,031
Auto Trips		132,923
Non-Commercial Pickup and Panel Trips		13,028

1/ 1968 Land Use Dwelling Unit Count does not include 1,648 Group Quarters classed as dwelling units in the O & D Survey.

2/ O & D data taken during movement of missile workers from area and many of the vacancies in O & D data are from vacant mobile homes throughout the area.

TRUCK SURVEY:

In 1961 a comprehensive survey was made of all commercial vehicles within the 1961 Study Area. It included a sampling of one-third of all trucks registered within the area, which amounted to a total of 1,517 vehicles. In the Update Study it was decided not to resample trucks, but to rely on data obtained from the base year, updated to reflect changes in commercial operation that were apparent from various other traffic inventories. These inventories included classification counts conducted at external stations, bridge crossings, and all the signalized intersections within the Study Area. Information thus generated provided the necessary data for accurately estimating increases in commercial vehicle travel. The 1961 Truck Survey included all pickup and panel trucks, and therefore these units were handled separately in all 1968 data collection procedures.

ACCURACY CHECKS:

Trip information from the origin and destination surveys was expanded to average week-day traffic volumes. Next, tabulations were made of those trips originating on one side of the Missouri River with destinations on the other side. Traffic volumes derived from Survey information were then compared to the actual count of vehicles crossing the Missouri River at the various bridge crossings.

Since it was decided not to resample truck travel for the Update Study, truck trips, including pickups and panels, were removed from the ground count and only auto trips were compared. Trips crossing the river were extracted from the expanded origin and destination data and were then compared by hour to the ground count as shown in Exhibit 4. In the first comparison, expanded origin and destination data amounted to 85.4% of the ground count. This comparison is summarized in Table No. 4. It was apparent from this comparison that under-reporting of trip information occurred during the Origin and Destination Survey. As has been determined from previous surveys of this nature, trips other than work trips are usually under-reported.

All trips not related to work were factored up by 30%, as was done in the Base Year Study. The origin and destination data then totaled 97.9% of the actual ground count between the hours of 6:00 A.M. and 9:00 P.M., as shown in Table No. 5.

EXHIBIT 4

SCREEN LINE COMPARISONS

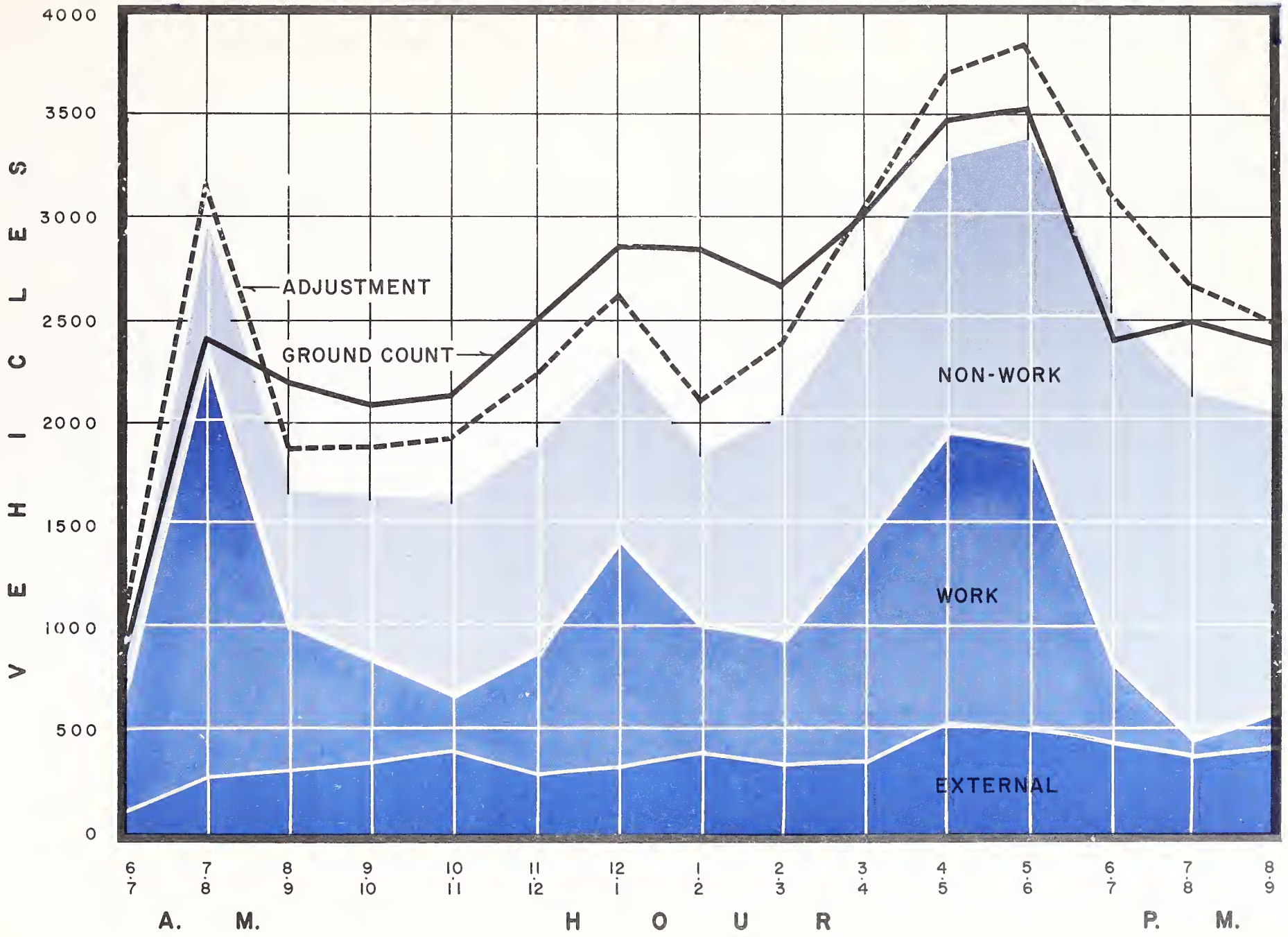


TABLE NO. 4

FIRST COMPARISON OF ORIGIN & DESTINATION DATA TO "GROUND COUNT"

	(1)	(2)	(3)	(4)	(5)
	Unfactored Internal Trips				Percent of
Hour	Work	Non-Work	External Auto	Total	Ground Count
6:00- 7:00 AM	628	147	101	876	96.1%
7:00- 8:00 AM	2,051	578	272	2,901	120.8
8:00- 9:00 AM	710	637	291	1,638	74.5
9:00-10:00 AM	529	751	328	1,608	77.1
10:00-11:00 AM	288	932	371	1,591	74.8
11:00-12:00 AM	557	1,020	274	1,851	75.3
12:00- 1:00 PM	1,063	949	294	2,306	80.5
1:00- 2:00 PM	626	815	354	1,795	62.8
2:00- 3:00 PM	575	1,096	327	1,998	74.5
3:00- 4:00 PM	1,025	1,247	324	2,596	86.6
4:00- 5:00 PM	1,423	1,329	502	3,254	93.8
5:00- 6:00 PM	1,419	1,459	467	3,345	95.5
6:00- 7:00 PM	364	1,695	440	2,499	102.5
7:00- 8:00 PM	113	1,639	345	2,097	84.1
8:00- 9:00 PM	170	1,442	380	1,992	83.8
TOTALS	11,541	15,736	5,070	32,347	85.4%

TABLE NO. 5

FINAL COMPARISON OF ORIGIN & DESTINATION DATA TO "GROUND COUNT"
(NON-WORK TRIPS FACTORED BY 1.30)

(6)	(7)	(8)	(9)
Factored Non-Work x 1.30	Total Columns 1, 3, 6	Percent of Ground Count	Ground Count
191	920	100.9%	912
751	3,074	128.0	2,402
828	1,829	83.2	2,198
976	1,833	87.9	2,086
1,212	1,871	87.9	2,128
1,326	2,157	87.8	2,457
1,234	2,591	90.5	2,864
1,060	2,040	71.4	2,858
1,425	2,327	86.8	2,681
1,621	2,970	99.0	2,999
1,728	3,653	105.3	3,469
1,897	3,783	108.0	3,502
2,204	3,008	123.3	2,439
2,131	2,589	103.9	2,492
1,875	2,425	102.0	2,378
20,459	37,070	97.9%	37,865

SUMMARY OF ORIGIN AND DESTINATION SURVEYS:

Trip tables were then produced showing all zone-to-zone movements, all external station to internal zone movements and through traffic by various trip purposes, for Internal, External, and Taxi Origin and Destination Surveys. Table No. 6 summarizes some selected travel information and compares 1961 and 1968 totals. Table No. 7 compares selected origin and destination travel characteristics for various trip purposes from 1961 to 1968. It should be noted that this table does not include truck trips, since no origin and destination information was available on truck travel for 1968. Complete trip tables showing all zone-to-zone trip movements for both internal and external travel are available.

TABLE NO. 6

1961 TO 1968 COMPARISONS OF SELECTED TRAVEL INFORMATION

Description	1961	1968	% Change From 1961
Total Internal Auto Driver Trips	109,689	170,645	+55.6%
Internal Auto Driver Trips Attracted to Central Business District	18,687	30,890	+65.3%
% of Auto Driver Trips Attracted to Central Business District	17.0%	18.1%	+ 1.1%
Bridge Traffic			
Warden Bridge	11,400	13,800	+21.1%
Central Avenue West Bridge	18,900	19,700	+ 4.2%
10th Street Bridge	10,400	7,000	-32.7%
15th Street Bridge	--	9,700	--
Total 10th & 15th Corridor	10,400	16,700	+60.6%
Total Crossings	40,700	50,200	+23.3%
External Traffic			
All Stations - All Vehicles	20,716	19,184*	- 7.4%
Through Traffic	932	1,138	+22.1%
Through Traffic, Percent of External	4.5%	5.9%	+ 1.4%

* Decrease because of cordon relocation.

TABLE NO. 7

1 9 6 1 - 1 9 6 8

COMPARISON OF ORIGIN AND DESTINATION SURVEY TRAVEL CHARACTERISTICS BY TRIP PURPOSE

Description	Trip Purpose											
	Home-Based Work		Home-Based Other		Non Home-Based		Internal Trucks		External All		Total (Internal Trucks Excluded)	
	1961	1968	1961	1968	1961	1968	1961	1968	1961	1968	1961	1968
Trips	20,073	25,490	59,095	84,621	32,096	60,534	19,677	N.A.	18,894	16,121	130,158	186,766
Intra Zonal Trips	222	142	2,108	4,135	2,195	4,741	2,759	N.A.	0	0	4,525	9,018
Hours of Travel	3,698	5,000	9,429	13,573	5,300	10,263	2,937	N.A.	3,711	3,778	22,138	32,614
Avg. Trip Length (Minutes)	11.05	11.77	9.57	9.62	9.91	10.17	8.96	N.A.	11.78	14.06	10.21	10.48

CHAPTER 3

EXISTING TRAVEL FACILITIES

MAJOR STREET NETWORK:

The major street network as shown in Exhibit 5 has been classified into three major categories, as follows:

Freeways and Ramps	8.0 Miles
Arterial Streets	82.9 Miles
Collector Streets	54.3 Miles
Total	145.2 Miles

Although the major street network of 1968 conforms basically to that of 1961, it will be noted that additional collector streets have been added in some areas. In the Central Business District all cross-streets from 2nd Street to 9th Street and between 2nd Avenue North and 2nd Avenue South have been added as collectors. Other collectors have been added in the Riverview Area and in the area south of 10th Avenue South.

The 1968 network, of course, does reflect all the major changes and additions to the system that have occurred since 1961, including those facilities serving the expanded Study Area. The following is a listing of major construction and additions to the system since the Base Year Study:

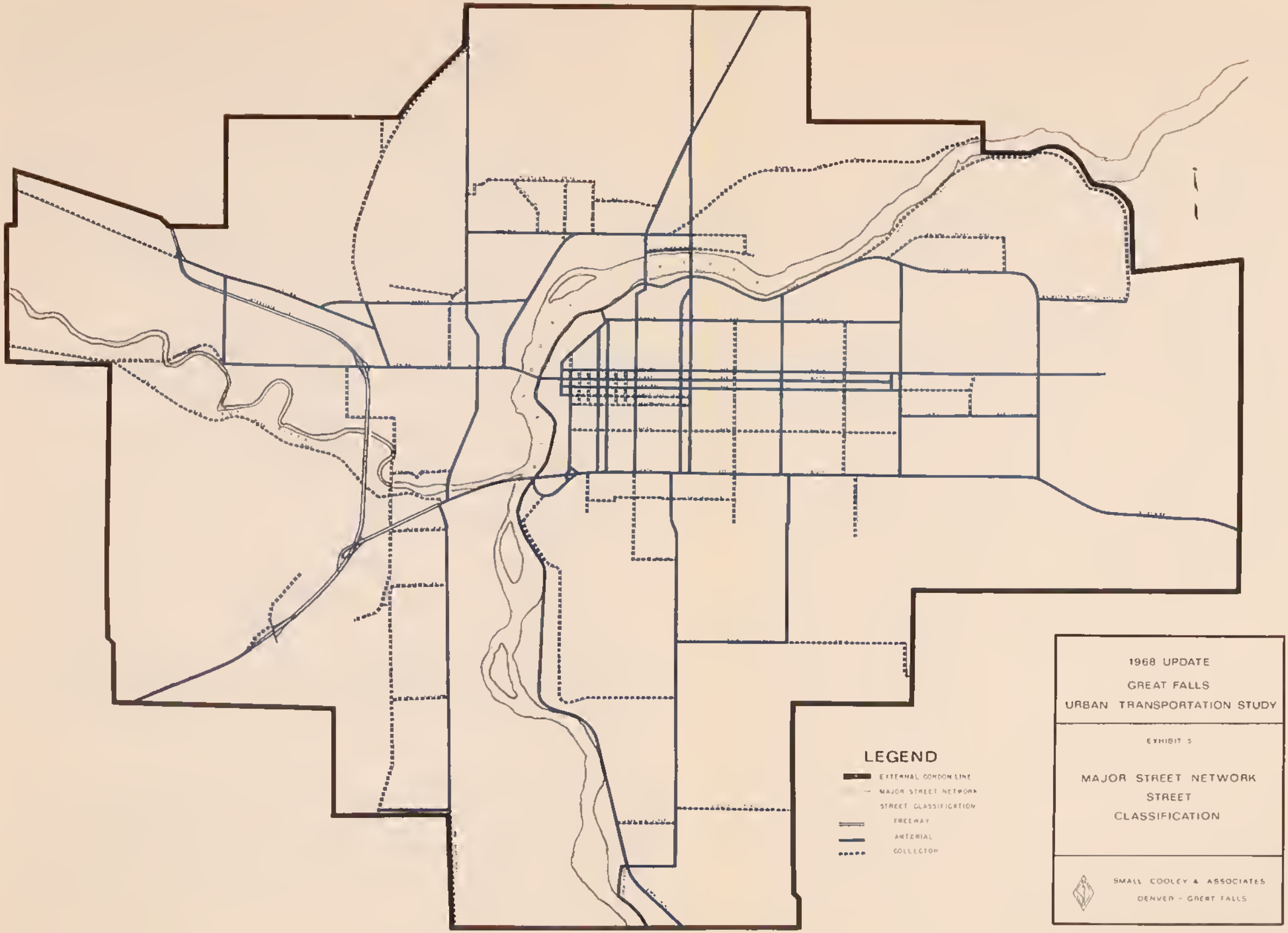
1. Interstate No. 15 from Gore Hill to Emerson Junction;
2. Northwest By-Pass from U.S. 89 to 3rd Street Northwest;
3. 14th and 15th Street One-Way Couplet, including the new 15th Street Bridge and the 15th Street extension north to its intersection with U.S. 87;
4. The additional One-Way Couplet on 5th and 6th Streets, from 8th Avenue North to 10th Avenue South; and
5. The North Gate access road to Malmstrom Air Force Base.

The network description and classification contained herein are those which, in the opinion of City, County, and State officials, best represent the conditions existing as of August, 1967.

The three types of facilities making up the major street network are defined as follows:

FREEWAYS AND RAMPS:

A multi-lane, divided facility with no at-grade intersections, along with its appurtenant interchanges and ramp connections to other portions of the network. This type of


LEGEND
EXTERNAL CORDON LINE
MAJOR STREET NETWORK
STREET CLASSIFICATION
FREEWAY
ARTERIAL
COLLECTOR
1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY
EXHIBIT 5
MAJOR STREET NETWORK
STREET
CLASSIFICATION
SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS

facility is used almost entirely to move traffic at relatively high speeds and for relatively long distances with no service to the abutting lands. In the Great Falls Transportation Study Area this type of facility is limited to Interstate 15 from Gore Hill to Emerson Junction, and the Interstate Spur from Gore Hill to Fox Farm Road.

ARTERIAL STREETS:

Facilities falling under this classification are primarily those designed for through traffic, usually on a continuous route. Arterials, as their name suggests, are the main traffic arteries of the community. In the Great Falls Transportation Area they carry a vast majority of the traffic, and, at the same time, provide service to abutting properties.

COLLECTOR STREETS:

Collector streets collect and distribute traffic between arterial streets and local streets. Collector streets serve as connectors within communities, and provide service to abutting properties.

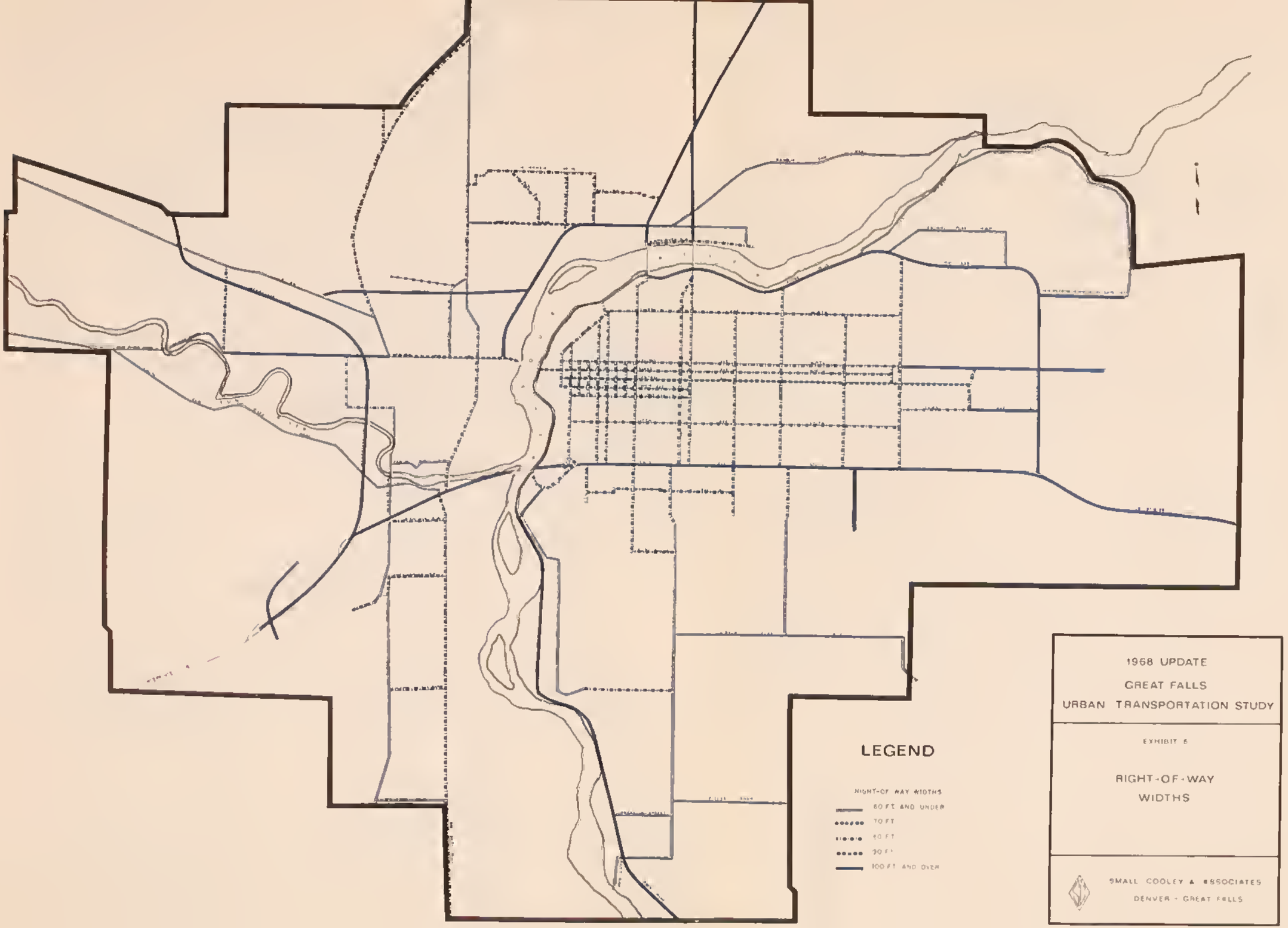
In addition to the major street network, the community has many other streets and roadways which are classed as local streets. These are considered in the planning process to be those streets providing direct access to adjacent property, and only serving local traffic.

STREET INVENTORY:

In order to properly plan improvements, it is necessary to have information relative to the physical characteristics of the major street network. Of prime importance are such things as: right-of-way widths, pavement widths, pavement types, and surface conditions.

For that portion of the major street network which remains unchanged since the 1961 Study, an inventory was readily available from the previous report. In the Update Study all facilities added to the system, including those in the expanded area, were inventoried. The characteristics of the 1968 Major Street Network, relative to right-of-way width, pavement width, and surface type, are shown respectively in Exhibits 6, 7, and 8.

As pointed out in the Base Year Study, the Great Falls Metropolitan Area should consider itself fortunate on two counts. First, the founder of Great Falls, Paris Gibson, had the foresight to provide for a minimum right-of-way width of 80 feet for the streets and avenues in the original townsite. This concept was extended in later planning and at the present time a large portion of the major

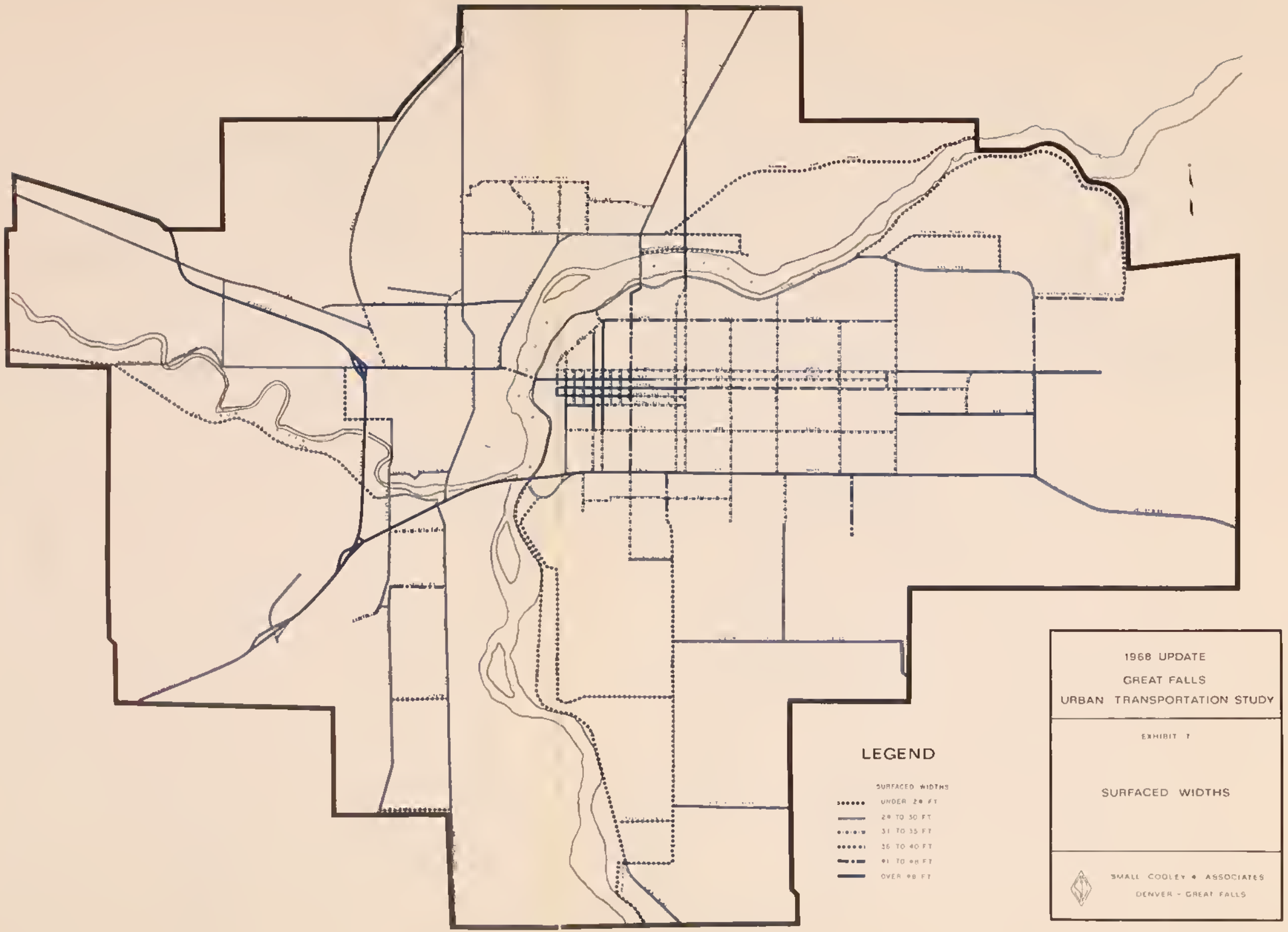


1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 6

RIGHT-OF-WAY
WIDTHS

SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS



1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 7

SURFACED WIDTHS

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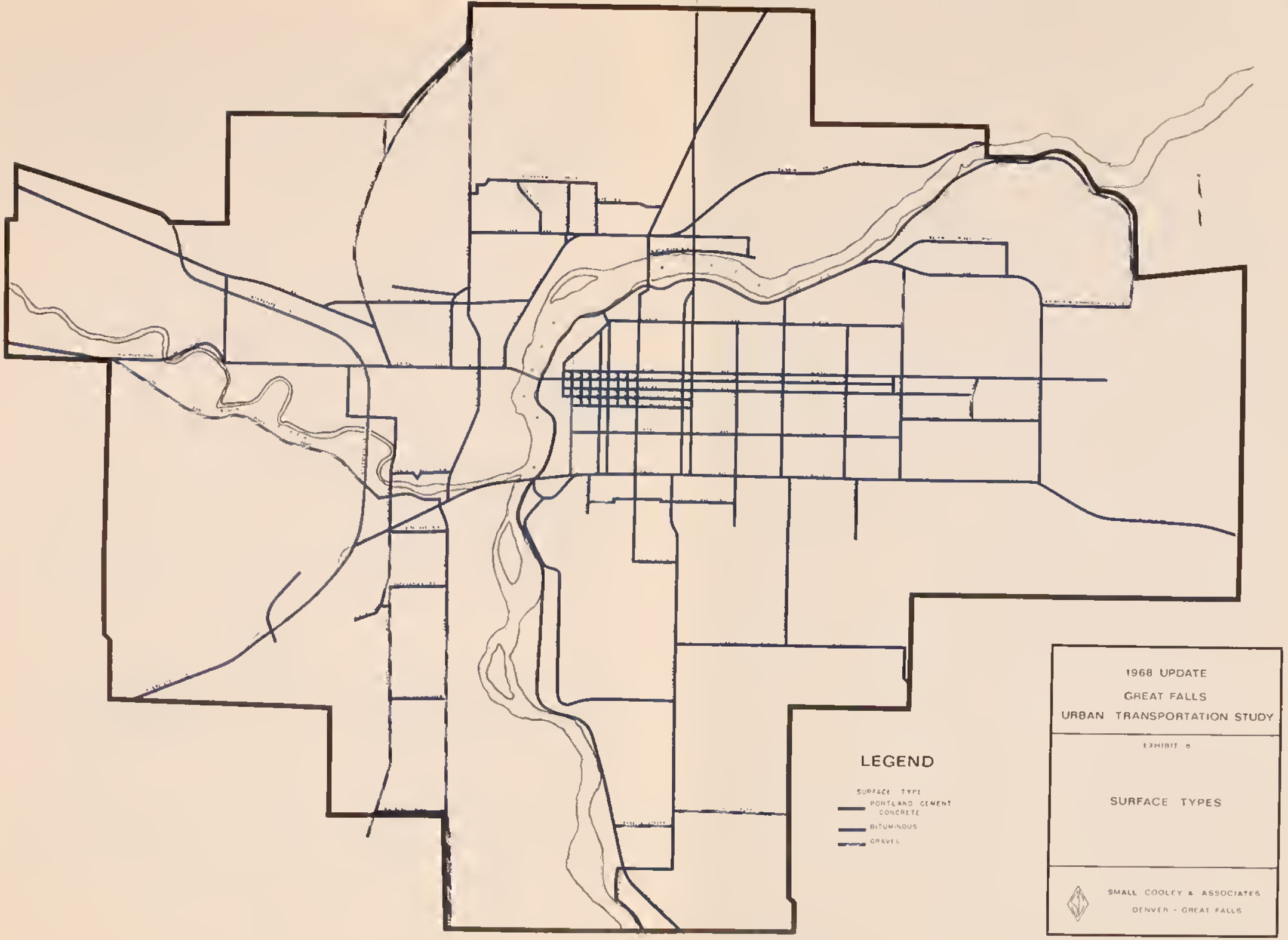

LEGEND
SURFACE TYPE
PORTLAND CEMENT CONCRETE
BITUMINOUS
GRAVEL
1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY
EXHIBIT 6
SURFACE TYPES
SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS

street network is equipped with adequate right-of-way widths. Second, the Great Falls City-County Planning Board, in conjunction with other City agencies and departments, has adhered to annexation policies requiring dedications of adequate rights-of-way for collector and arterial streets in all new subdivisions. As a result of these two circumstances, the City and surrounding areas will derive great benefits from being able to utilize their street and highway funds for construction, and not be burdened with expensive right-of-way acquisitions.

The results of the Street Inventory, as to surface type for the major street network, are summarized below.

Pavement Type	Approximate Miles
Unsurfaced	0
Graveled Surface	17.5
Bituminous	120.0
Portland Cement	7.7
Total	145.2

SIGNAL INVENTORY:

The inventory of the traffic signals within the Study Area was completed during February and March of 1968.

Two work sheets were developed to use in taking the field notes and recording the signal data. The first work sheet was used to record such information as location, type of controller equipment, manufacturer and capabilities of the equipment, and the dial settings or timing of the signal operation.

The second work sheet provided space to make a schematic sketch of the intersections, showing number, location, and type of support of each of the traffic signal heads. Information such as parking, controller location, island and median locations, were also shown on the sketch. Sketches were also made showing the phasing of the signal operation.

The physical signal arrangement and the signal operation were compared with the standards as set forth in the Manual on Uniform Traffic Control Devices for Streets and Highways, prepared by the National Joint Committee on Uniform Traffic Control Devices, and which has been adopted by the Montana Highway Commission. Value judgments were also made as to how the signal arrangements and operation compared with accepted engineering practice or other safety considerations.

Deficiencies of the signalized intersections within the Study Area generally fell into one or more of the following categories:

A. Inadequate Pedestrian Safety Consideration.

This usually involved inadequate pedestrian clearance incications and/or clearance time. "Walk" and "Wait" messages on standard round traffic lenses are used at several locations which should be replaced with the more familiar separate square pedestrian indications located on the far side of the crosswalk that they serve. When pedestrian "walk" indications are used, there should always be given an adequate "don't walk" period to allow the crosswalk to be cleared before the next vehicle phase is allowed.

At locations where pedestrian indications are not used, there should be provided a normal vehicle red, amber and green indication located on the far side in a position where the pedestrian can view it until he has reached the far side of the crosswalk. Normally, pedestrian push buttons should be provided at all locations when the signal is vehicle actuated, unless the possibility of a pedestrian using the intersection is remote.

B. Inadequate Vehicle Signal Indication and Signal Head Position.

There are several signalized intersections where there is only one signal indication per direction. Most of the intersections which fall into this type are those where a single signal head is suspended in the center of the intersection. However, there are other locations such as on the east approach to the intersection of Central Avenue and Park Drive where there is only one far-side signal indication. The national standards call for two signal indications on the far side of the intersection for each approach.

C. Inadequate Signal Operation.

The timing and setting of the signal controllers should be reviewed periodically and reset to more efficiently serve the changing travel patterns and increase or decrease in traffic volumes.

At several locations inadequate clearance time, or no clearance time at all, is given to some vehicle movements. Any movement which is being terminated should always be provided with an amber clearance period which is of sufficient duration to allow the driver to come to a stop or clear the intersection. It is not always possible to include an amber indication at locations where a turning arrow is being terminated; however, an adequate amount of time should be provided

between the time the arrow is terminated and the conflicting traffic movement is allowed.

There are two locations where, in our judgment, the application of turn arrows are inappropriately applied. One is at the intersection of 14th Street and 10th Avenue South, where the left turns from the east are given a green arrow indication, but the left-turn movement is in conflict with the eastbound through movement. This is not a normal application of a green arrow and, although the local residents may be accustomed to the operation, the out-of-state motorist could easily misinterpret the meaning of the green arrow.

The other location where turn arrows are used inappropriately is at the intersection of 1st Avenue South and 2nd Street South. Here again, turn arrows are used to direct traffic across or into conflicting movements.

The Signal Inventory summary sheets shown on the following pages list each signalized intersection and the type of equipment in operation.

The Inventory of Substandard Traffic Signals lists the substandard signals by location, controller type and deficiencies causing the signal to be classified as substandard.

PUBLIC BUS SYSTEM:

There is at present no public bus system in Great Falls. This subject was investigated and a report separately published in June of 1968 as "Feasibility of Transit Service in Great Falls, Montana" by Simpson and Curtin of Philadephia, Pennsylvania.

TRAFFIC SIGNAL CONTROLLER INVENTORY SUMMARY SHEET

SIGNAL NO.	LOCATION	NO. OF PHASES	TYPE OF CONTROL	INTERCONNECTION	CONTROLLER MANUFACTURER	CONTROLLER MODEL	REMARKS
1.	River Dr & 15th St	2	Semi-Actuated	None	Automatic	517	Vehicle Actuated Controller
					Automatic	MR-10	Magnetic Detector Amplifier
2.	8th Ave No & 9th St	2	Semi-Actuated	None	Eagle	A-ET41B	Vehicle Actuated Controller
3.	2nd Ave No & Park Dr	2	Flasher	None	Gen. Elec.	--	
4.	2nd Ave No & 3rd St	2	Pretimed	Sync Only	Eagle	EA537	1 Dial - 1 Offset - Non Expansible Controller
					Sangamo	L-11	Time Clock - Flashing
5.	2nd Ave No & 4th St	2	Pretimed	Sync Only	Eagle	EA537	1 Dial - 1 Offset - Non Expansible Controller
					Sangamo	L-11	Time Clock - Flashing
6.	2nd Ave No & 6th St	2	Pretimed	Sync Only	Eagle	EA537	1 Dial - 1 Offset - Non Expansible Controller
					Sangamo	L-11	Time Clock - Flashing
7.	2nd Ave No & 9th St	2	Pretimed	Sync Only	Econolite	2HF112B2	1 Dial - 3 Offset - Expansi.
					Sangamo	Type B	Time Clock - Flashing
8.	2nd Ave No & 14th St	2	Pretimed	6 Function	Econolite	2HF11231	3 Dial - 3 Offset
9.	2nd Ave No & 15th St	2	Pretimed	6 Function	Econolite	2HF11231	3 Dial - 3 Offset
10.	2nd Ave No & 25th St	2	Semi-Actuated	None	Automatic	505AN	Vehicle Actuated Controller
					Automatic	PT-1	Ped. Interval Timer
					Automatic	MR-9	Magnetic Detector Amplifier
11.	2nd Ave No & 37th St	2	Flasher	None	Eagle	--	Flashing Green Arrow
12.	2nd Ave No & 38th St	2	Semi-Actuated	None	Automatic	505	Spare 505 controller was in use
					Automatic	PT-1	Ped. Internal Timer
13.	2nd Ave No & 57th St	3	Full-Actuated	None	Automatic	1826N	Vehicle Actuated Controller
					Automatic	MR10	3 Magnetic Det. Amplifiers
14.	1st Ave No & River Dr	2	Semi-Actuated	None	Automatic	505 AN	Ped. Push Buttons
					Automatic	MR10	Magnetic Detector Amplifier
15.	1st Ave No & Park Dr	2	Volume-Density	None	Automatic	1022N	Volume Density Controller
					Automatic	MR9	Magnetic Detector Amplifier
					Eagle	EW55	2 Loop Detector Amplifiers

SIGNAL NO.	LOCATION	NO. OF PHASES	TYPE OF CONTROL	INTERCONNECTION	CONTROLLER MANUFACTURER	CONTROLLER MODEL	REMARKS
16.	1st Ave No & 2nd St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
17.	1st Ave No & 3rd St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
18.	1st Ave No & 4th St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
19.	1st Ave No & 5th St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
20.	1st Ave No & 6th St	2	Pre-Timed	Sync & Flash	General Elec.	2TC24	1 Dial - 3 Offset - Expan.
21.	1st Ave No & 7th St	2	Pre-Timed	Sync Only	General Elec.	---	1 Dial - 3 Offset - Expan.
22.	1st Ave No & 9th St	2	Pre-Timed	Sync Only	Econolite	---	1 Dial - 3 Offset - Expan.
					General Elec.	---	Time Clock - Flashing
23.	1st Ave No & 14th St	2	Pre-Timed	6-Function	Econolite	---	3 Dial - 3 Offset - Master
					---	---	3 Dial Programmer Clock
24.	1st Ave No & 15th St	2	Pre-Timed	6-Function	Econolite	---	3 Dial - 3 Offset
25.	1st Ave No & 25th St	2	Semi-Actuated	None	Automatic	507	Veh. Actuated Controller
					Automatic	PT-1	Ped. Interval Timer
					Time-O-Matic	3	Function Unknown
					Automatic	MR-9	Magnetic Detector Amplifier
26.	Central Ave & Park Dr	3	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
27.	Central Ave & 2nd St	2	Pre-Timed	Sync & Flash	Gen. Electric	---	1 Dial - 3 Offset - Expan.
28.	Central Ave & 3rd St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
29.	Central Ave & 4th St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
30.	Central Ave & 5th St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
31.	Central Ave & 6th St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
32.	Central Ave & 7th St	2	Pre-Timed	Sync & Flash	Econolite	---	1 Dial - 3 Offset - Expan.
33.	Central Ave & 8th St	2	Pre-Timed	Sync Only	General Elec.	---	1 Dial - 3 Offset - Expan.
					General Elec.	---	Time Clock - Flashing
34.	Central Ave & 9th St	2	Pre-Timed	Sync Only	Econolite	---	1 Dial - 3 Offset - Expan.
					Intermatic	T101	Time Clock - Flashing
35.	Central Ave & 14th St	2	Pre-Timed	6-Function	Econolite	---	3 Dial - 3 Offset
36.	Central Ave & 15th St	2	Pre-Timed	6-Function	Econolite	---	3 Dial - 3 Offset
37.	Central Ave & 25th St	2	Pre-Timed	None	Eagle	ET3592	1 Dial - 1 Offset - Non Expansible
					Sangamo	---	Time Clock - Flashing
38.	1st Ave So & 2nd St	2	Pre-Timed	Sync Only	Econolite	---	1 Dial - 3 Offset - Expan.
					Gen. Electric	3T57Y65C	Time Clock - Flashing
39.	1st Ave So & 3rd St	2	Pre-Timed	Sync Only	Econolite	---	1 Dial - 3 Offset - Expan.
					Intermatic	T103	Time Clock - Flashing
40.	1st Ave So & 4th St	2	Pre-Timed	Sync & Flash	Gen. Electric	---	1 Dial - 3 Offset - Expan.

Note: Expan. = Expansible

SIGNAL NO.	LOCATION	NO. OF PHASES	TYPE OF CONTROL	INTERCONNECTION	CONTROLLER MANUFACTURER	CONTROLLER MODEL	REMARKS
41.	1st Ave So & 5th St	2	Pre-Timed	Sync & Flash	Gen. Electric	---	1 Dial - 3 Offset - Expan.
42.	1st Ave So & 6th St	2	Pre-Timed	Sync Only	Gen. Electric	---	1 Dial - 3 Offset - Expan.
					---	---	Time Clock Flashing
43.	1st Ave So & 9th St	2	Pre-Timed	Sync Only	Gen. Electric	---	1 Dial - 3 Offset - Expan.
					Paragon	4001-0	Time Clock - Flashing
44.	2nd Ave So & 4th St	2	Pre-Timed	Sync Only	Gen. Electric	---	1 Dial - 3 Offset - Expan.
					Tork	1191SK	Time Clock - Flashing
45.	2nd Ave So & 5th St	2	Pre-Timed	Sync & Flash	Gen. Electric	---	1 Dial - 3 Offset - Expan.
46.	2nd Ave So & 6th St	2	Flasher	None	---	---	---
47.	2nd Ave So & 9th St	2	Pre-Timed	Sync Only	Gen. Electric	---	1 Dial - 3 Offset - Expan.
					Gen. Electric	T57Y	Time Clock - Flashing
48.	2nd Ave So & 14th St	-	Future	Signal	---	---	---
49.	6th Ave So & 9th St	2	Pre-Timed	None	Eagle	EAS537	1 Dial - 1 Offset - Non Expansible
					Sangamo	L11	Time Clock - Flashing
50.	10th Ave So & 2nd St	3	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	TM-24	Co-ord Unit
					Automatic	G-2	Adv. Green Timer
					Automatic	MR-10	Magnetic Detector Amplifier
51.	10th Ave So & 5th St	2	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	TM-24	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier
52.	10th Ave So & 7th St	2	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	TM-24	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier
53.	10th Ave So & 9th St	3	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	G-2	Adv. Green Timer
					Automatic	TM-24	Co-ord Unit
					Automatic	---	Pre-emptor Timer
					Automatic	---	Pre-emptor Clearance Timer
					Automatic	MR-10	3 Magnetic Detector Ampli.
					Tork	8000	Master Programmer Time Clock
					Automatic	TM-1	Master Cycle Offset Selector
54.	10th Ave So & 11th St	2	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	TM-24	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier
55.	10th Ave So & 13th St	2	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	TM-24	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier

SIGNAL NO.	LOCATION	NO. OF PHASES	TYPE OF CONTROL	INTERCONNECTION	CONTROLLER MANUFACTURER	CONTROLLER MODEL	REMARKS
56.	10th Ave So & 14th St	2	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	TM-24	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier
57.	10th Ave So & 15th St	3	Semi-Actuated	7-Function	Automatic	517	Vehicle Actuated Controller
					Automatic	G-2	Adv. Green Timer
					Automatic	TM-24	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier
58.	10th Ave So & 25th St	3	Full-Actuated	None	Automatic	804N	Vehicle Actuated Controller
			Fixed Lt Turn	---	Automatic	G-2	Adv. Green Timer
					Automatic	PT-1	Ped. Interval Timer
					Automatic	MR-10	2 Mag. Detector Amplifier
59.	Smelter Ave & 10th St	2	Pre-Timed	None	Crouse Hinds	GS-5	1 Dial - 1 Offset - Non Expansible
60.	No River Rd & 15th St	2	Semi-Actuated	None	Automatic	517	Vehicle Actuated Controller
					Automatic	MR-10	Magnetic Detector Amplifier
61.	9th Ave NW & 9th St NW	2	Semi-Actuated	5-Function	Automatic	T-527RMC	S.S. Vehicle Actuated Cont.
					Automatic	MR10	Magnetic Detector Amplifier
					Automatic	---	Railroad Pre-emptor
					Automatic	---	Co-ord Unit
					General Time	---	Delay Timer
					Sangamo	WHR22	3 Time Clocks - Cycle - Offset, Free
62.	9th Ave NW & 6th St NW	2	Semi-Actuated	5-Function	Automatic	T-527RMC	S.S. Vehicle Actuated Cont.
					Automatic	Slave	Co-ord Unit
					Automatic	MR-10	Magnetic Detector Amplifier
63.	Central Ave W & 9th St NW	2	Pre-Timed	6-Function	Econolite	---	1 Dial - 3 Offset - Expan.
64.	Cent Ave W & 6th St NW	3	Pre-Timed	6-Function	Econolite	---	1 Dial - 3 Offset - Expan. Master Controller
					Gen. Electric	3TSA	2 Time Clocks, Offset Selec.
65.	Cent Ave W & 5th St NW	2	Pre-Timed	6-Function	Econolite	---	1 Dial - 3 Offset - Expan.
					Gen. Electric	---	Time Clock - System Flash
66.	Centr Ave W & 3rd St NW	3	Pre-Timed	6-Function	Gen. Electric	---	1 Dial - 3 Offset - Expan. Controller
67.	Buttrey's & 6th St SW	2	Pre-Timed	None	Eagle	ETS592	1 Dial - non Expansible
	Note: This was on 24-hour flash at time of inventory and has since been removed.						
68.	Interstate Spur & Fox Farm Road	2	Flasher	None	---	---	---

INVENTORY OF SUBSTANDARD TRAFFIC SIGNALS

Signal Location Number	Controller Type	Substandard			
		As To Number Of Heads	As To Location Of Heads	As To Operation	As To Pedestrian Protection
4	1	X	X	X	X
5	1	X	X	X	X
6	1		X	X	X
7	3		X	X	X
8	3				
9	3				
14	4 or 5			X	X
15	4				X
16	3			X	X
17	3			X	X
18	3			X	X
19	3			X	X
20	3	X	X	X	X
21	3	X	X	X	X
22	3		X	X	X
23	3				
24	3				
26	3	X	X	X	X
27	3			X	X
28	3		NLT	Lane Control	
29	3		NLT	Lane Control	
30	3				
31	3				
32	3				
33	3	X	X	X	X
34	3	X	X		X
35	3				
36	3				
38	3		X	X	X
39	3		X	X	X
40	3			X	X
41	3			X	X
42	3	X	X	X	X
43	3	X	X	X	X
44	3	X	X	X	X
45	3	X	X	X	X
47	3	X	X	X	X

Controller Types:
1. 1 cycle - 1 offset - non expansible.
2. 1 cycle - 3 offset - non expansible.
3. Expansible to 3 dial - 3 offset.
4. Traffic actuated - capable of being coordinated.
5. Traffic actuated - not capable of being coordinated.

Note: There are 30 signals in the Central Business District, and of these only three are not substandard in some respect. Twenty-five are substandard as to pedestrian protection or operation.

* For signal location see Traffic Signal Controller Inventory Summary Sheets.

CHAPTER 4

PRESENT TRAVEL CHARACTERISTICS

PRESENT TRAFFIC VOLUMES:

Traffic counts were made during the summer and fall of 1967 and again in the summer of 1968 on all segments of the major street network. Both machine counts and manual counts were used to obtain traffic volume, turning movement and classification data. Exhibits 9 and 9A illustrate the average daily traffic volumes that were determined by adjusting counts to an annual average by the application of seasonal factors.

Since the network has changed since 1961, some significant changes have occurred in traffic patterns on major portions of the network. The inclusion of the Northwest By-Pass at about 9th Avenue Northwest has reduced the overall traffic volumes on Central Avenue West, particularly between 6th and 9th Streets. Another significant change occurred after the implementation of the 14th and 15th Street one-way couplets. It is also interesting to note the changes in traffic volumes crossing the Missouri River at the four bridge locations. On the following page is a summary of traffic volumes for the two study years.

Bridge Location	1961 Average Daily Traffic	1968 Average Daily Traffic
Tenth Street	10,400	7,000
First Avenue North	18,900	19,700
Tenth Avenue South	11,400	13,800
Fifteenth Street	N.A.	9,700
Total Traffic	40,700	50,200

This comparison shows that the major volume increases on the bridges occur at the north-south crossings of the river, including both the 10th and 15th Street Bridges. Traffic volumes for this corridor in 1961 totaled 10,400 vehicles per day, all confined to the 10th Street Bridge. In 1968 a combination of the 10th and 15th Street Bridges carried 16,700 vehicles per day, an increase of over 60% in traffic volumes between 1961 and 1968 for the total corridor. This compares to a total increase in traffic crossing the river of approximately 23%. This, of course, is a result of the rapid build-up in the Riverview Area coupled with the new commercial development on 10th Avenue South.

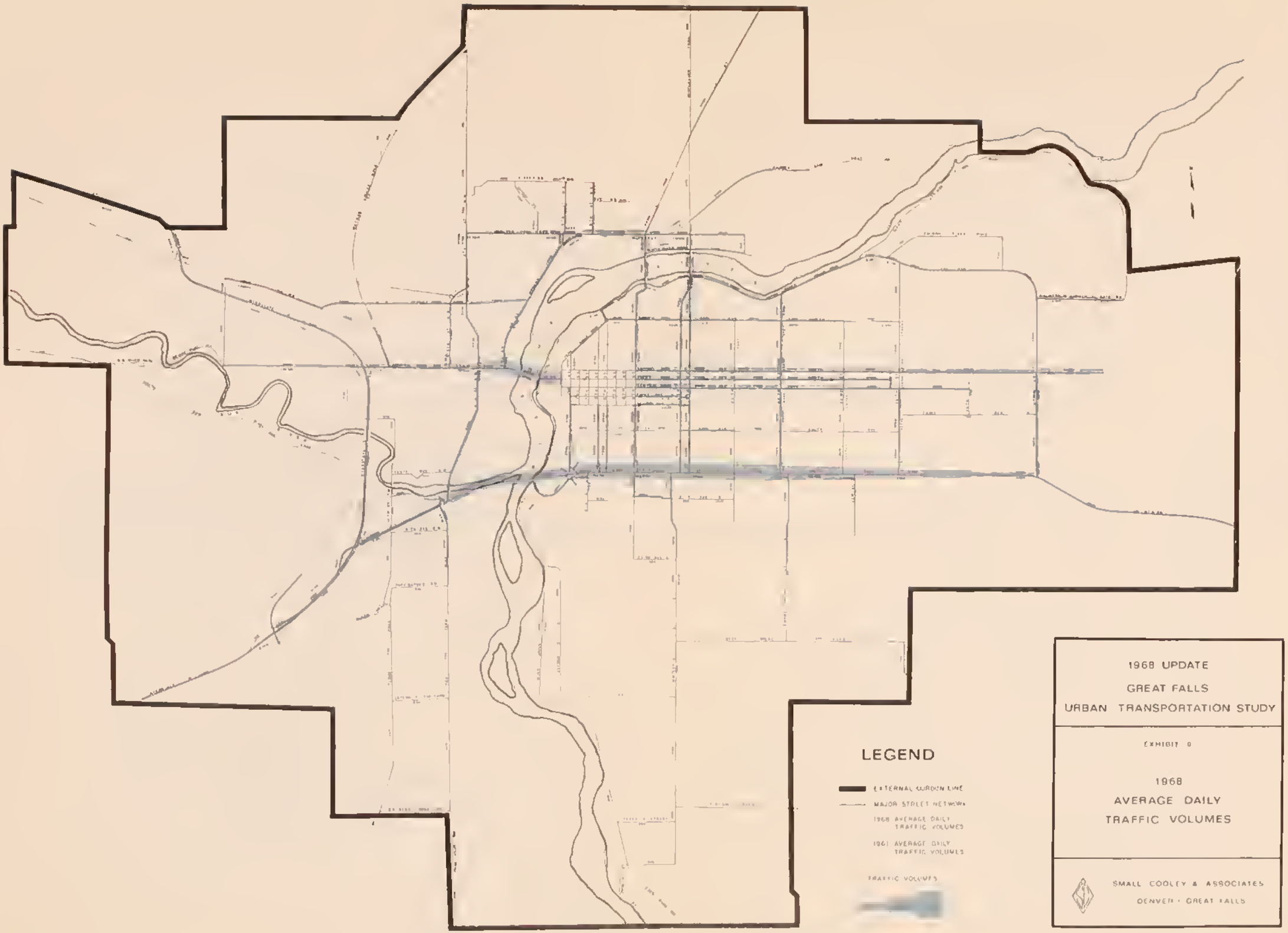
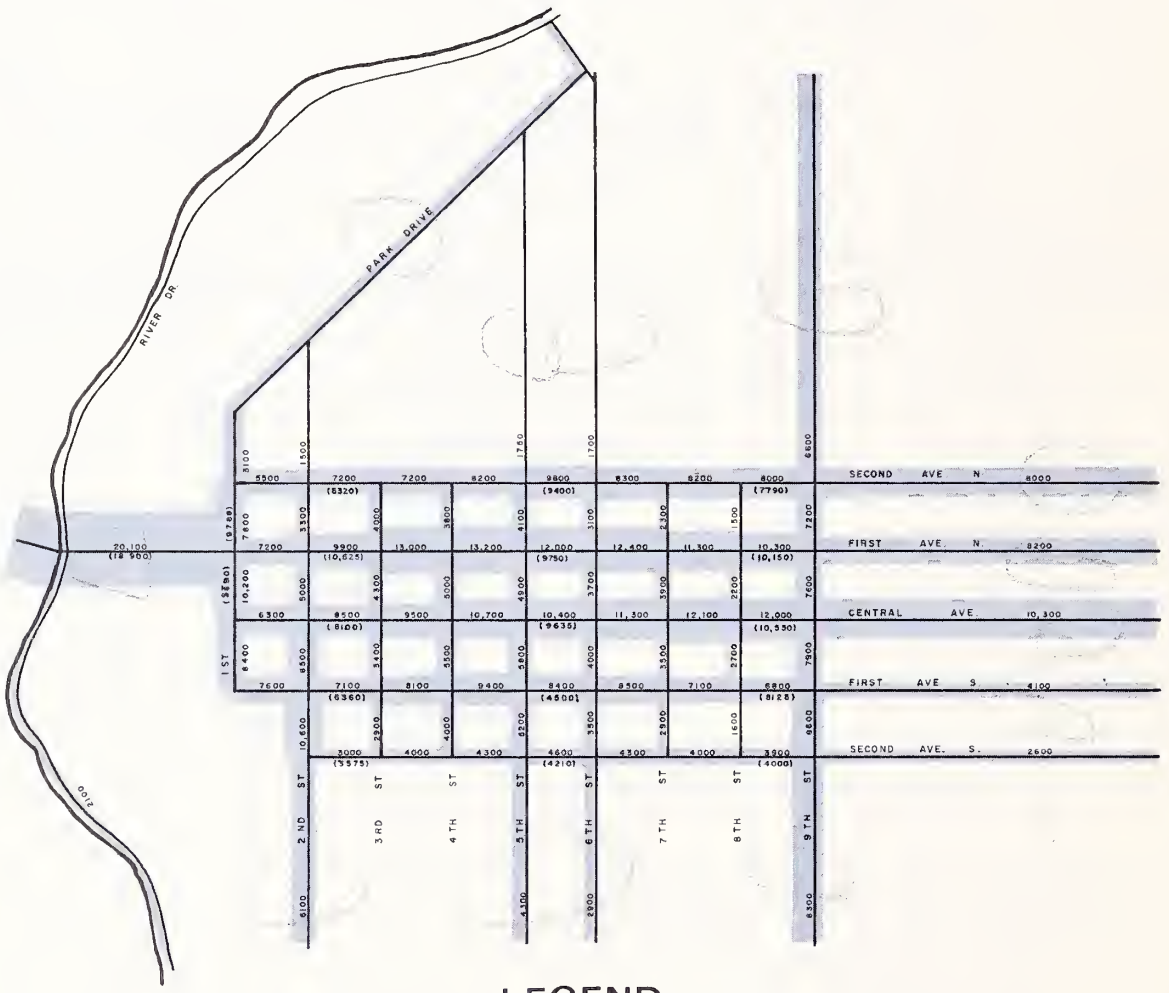

LEGEND
EXTERNAL CORDON LINE
MAJOR STREET NETWORK
1968 AVERAGE DAILY TRAFFIC VOLUMES
1961 AVERAGE DAILY TRAFFIC VOLUMES
TRAFFIC VOLUMES
1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY
EXHIBIT 8
1968
AVERAGE DAILY
TRAFFIC VOLUMES
SMALL COOLEY & ASSOCIATES
DENVER · GREAT FALLS

EXHIBIT 9A

1968 AVERAGE DAILY TRAFFIC VOLUMES

CENTRAL BUSINESS DISTRICT



LEGEND

——— MAJOR STREET NETWORK

0000 1968 AVERAGE DAILY TRAFFIC VOLUMES

(0000) 1961 AVERAGE DAILY TRAFFIC VOLUMES

TRAFFIC VOLUMES

N

PEAK-HOUR TRAFFIC VOLUMES:

Turning movement counts during peak hours of travel were made at 121 intersections on the major street system similar to the procedure used in the 1961 Study. Morning, noon and evening peak hours were included in the turning movement counts. From these counts the peak-hour of travel was determined to be between 4:30 P.M. and 5:30 P.M. on an average week-day. Peak-hour volumes in 1968 amounted to about 10% of the 24-hour traffic volume. As was found to be the case in 1961, lesser peaks occurred between 7:30 and 8:30 A.M., and between 12:00 Noon and 1:00 P.M.

VEHICLE MILES OF TRAVEL:

Computer programs utilized in the Update Study did provide a means for totaling vehicle miles of travel by the various jurisdictions described in Chapter 2. Table No. 8 summarizes vehicle miles of travel and vehicle hours of travel experienced on the 1968 total street network. Total vehicle miles of travel in 1968 amounted to 577,807, compared to 363,000 vehicle miles of travel for 1961. Of course, a portion of this increase results from the expansion of the Study Area.

With the Transportation Study Area population of 78,000 persons (City-County Planning Board estimate), there is an average of 7.4 vehicle miles of travel per resident in 1968. This compares to an average of 4.9 miles per resident in 1961.

As was indicated in the preceding paragraph a portion of this increase is due to the expansion of the Study Area.

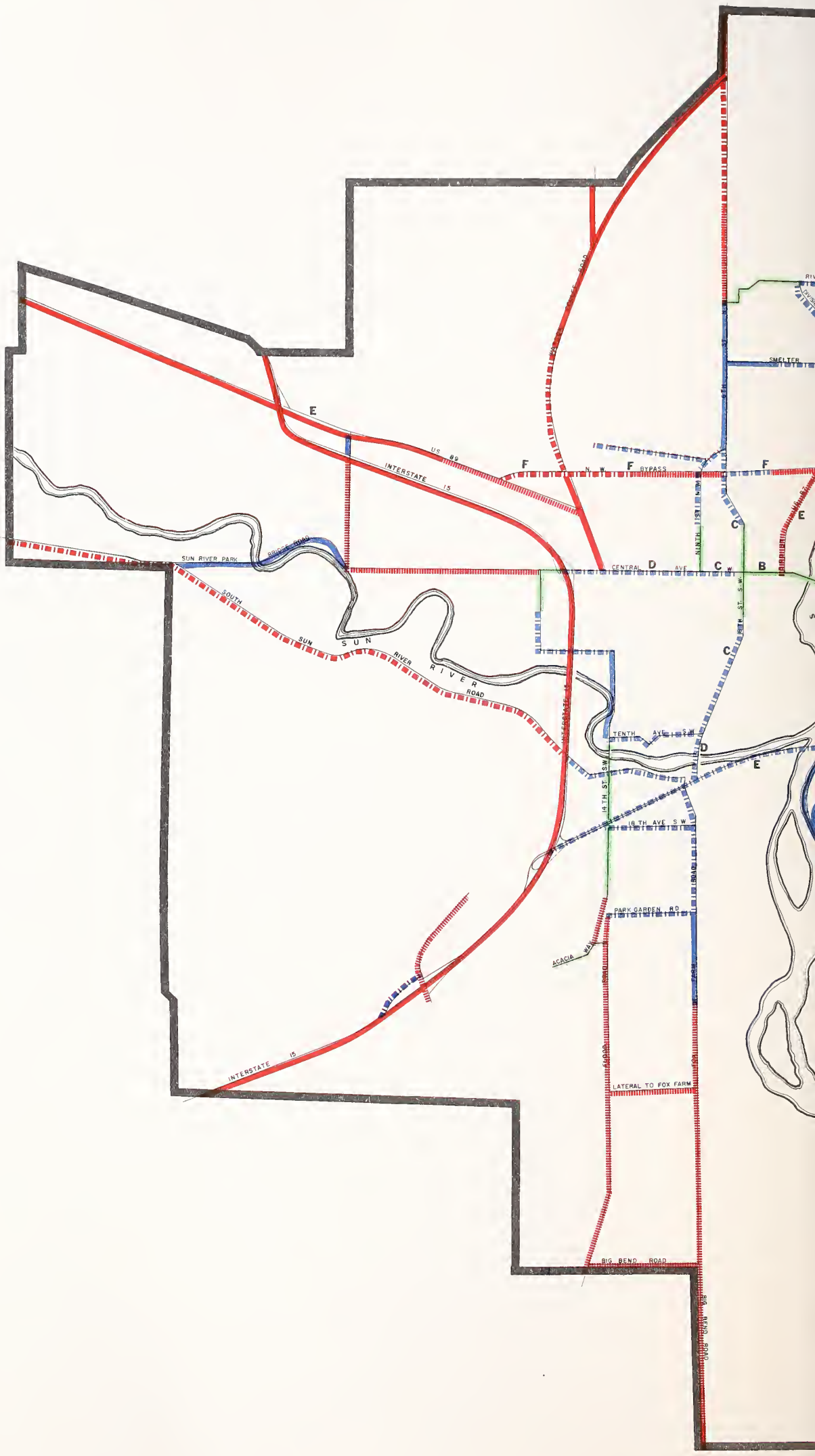
TABLE NO. 8

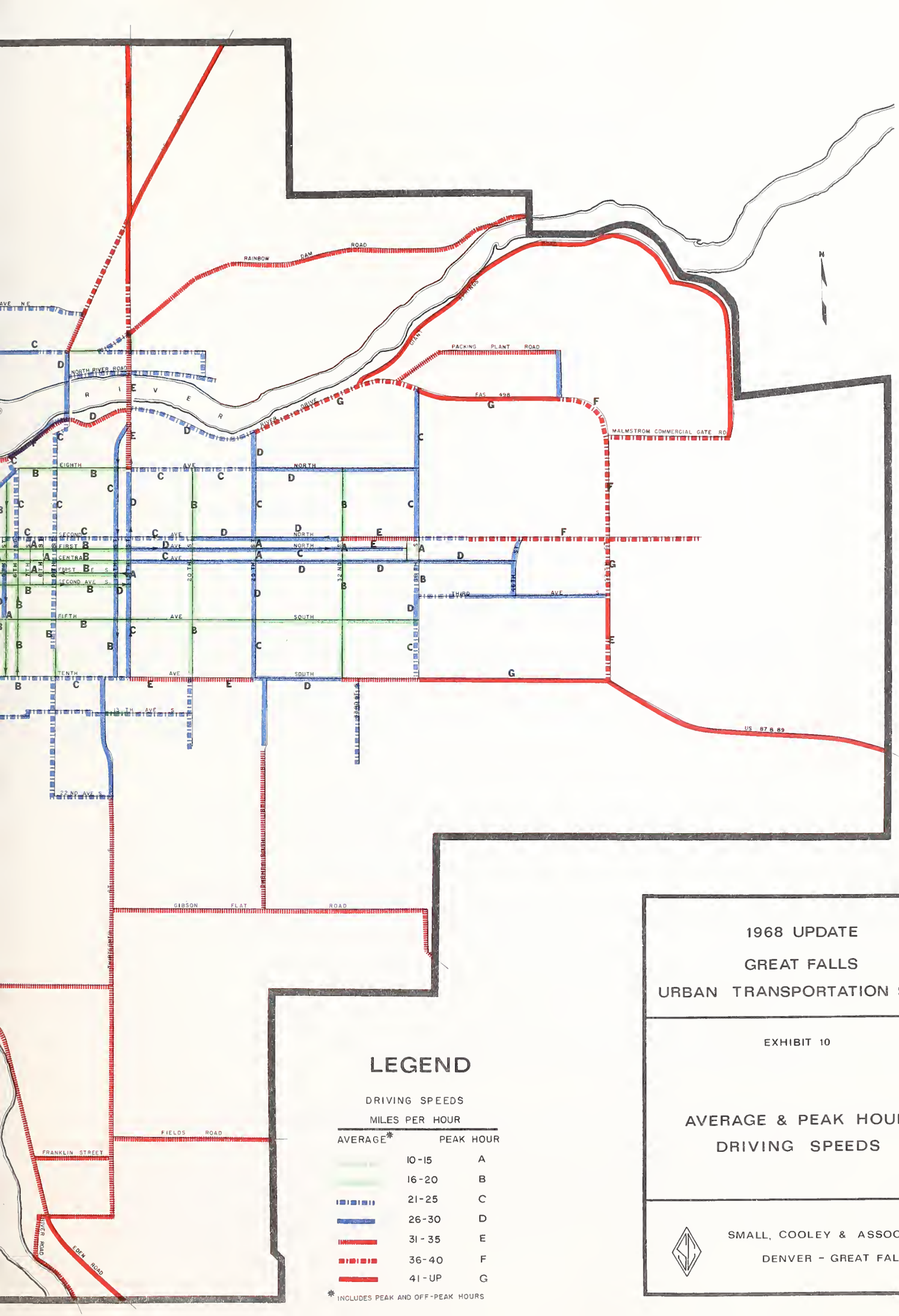
SUMMARY OF VEHICLE MILES AND HOURS - 1968 NETWORK

Code	Juris-diction	Local Streets Veh. Miles	Local Streets Veh. Hours	Arterial Veh. Miles	Arterial Veh. Hours	Ramps Veh. Miles	Ramps Veh. Hrs.	Freeways Veh. Miles	Freeways Veh. Hrs.	Totals Miles	Totals Hours
0	County	16,152	973	43,629	1,366	0	0	0	0	59,781	2,339
1	City	48,790	3,546	133,375	5,946	0	0	0	0	182,165	9,492
2	State Primary City	0	0	214,605	8,434	924	56	7,887	143	223,416	8,633
3	State Primary County	0	0	80,047	3,356	4,784	132	27,614	499	112,445	3,987
	Totals	64,942	4,519	471,656	19,102	5,708	188	35,501	642	577,807	24,451

Total Vehicle Miles = 577,807

Total Vehicle Hours = 24,451


SMELTER
E
US 89
INTERSTATE 15
F
N. W. BYPASS
F
F
E
C
NINTH ST. S.W.
SUN RIVER PARK
BRIDGE ROAD
CENTRAL AVE
D
C
B
SOUTH SUN RIVER ROAD
SUN RIVER
C
TENTH AVE S.W.
D
E
14TH ST. S.W.
18TH AVE S.W.
PARK GARDEN RD.
ACACIA WAY
INTERSTATE 15
LATERAL TO FOX FARM
BIG BEND ROAD
BIG BEND ROAD



LEGEND

DRIVING SPEEDS

MILES PER HOUR

AVERAGE*	PEAK HOUR
10-15	A
16-20	B
21-25	C
26-30	D
31-35	E
36-40	F
41-UP	G

* INCLUDES PEAK AND OFF-PEAK HOURS

1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 10

AVERAGE & PEAK HOUR DRIVING SPEEDS

SMALL, COOLEY & ASSOCIATES
DENVER - GREAT FALLS

CHAPTER 5

THE QUALITY OF TRAFFIC SERVICE

GENERAL:

The quality of service of a street system of a community is generally measured by such factors as average driving speeds, vehicle delay rates, intersection traffic capacities, and accident rates. All of these factors were analyzed in both the Base Year Study and the Update Study in an effort to determine efficiencies of the major street network.

AVERAGE DRIVING SPEED:

Auto drivers usually measure the desirability of a route on the basis of total travel time between the origin and destination of a particular trip. The factor of travel time is utilized throughout the Transportation Study in projecting future travel on individual routes and thus becomes an extremely important element in the evaluation of a major street system.

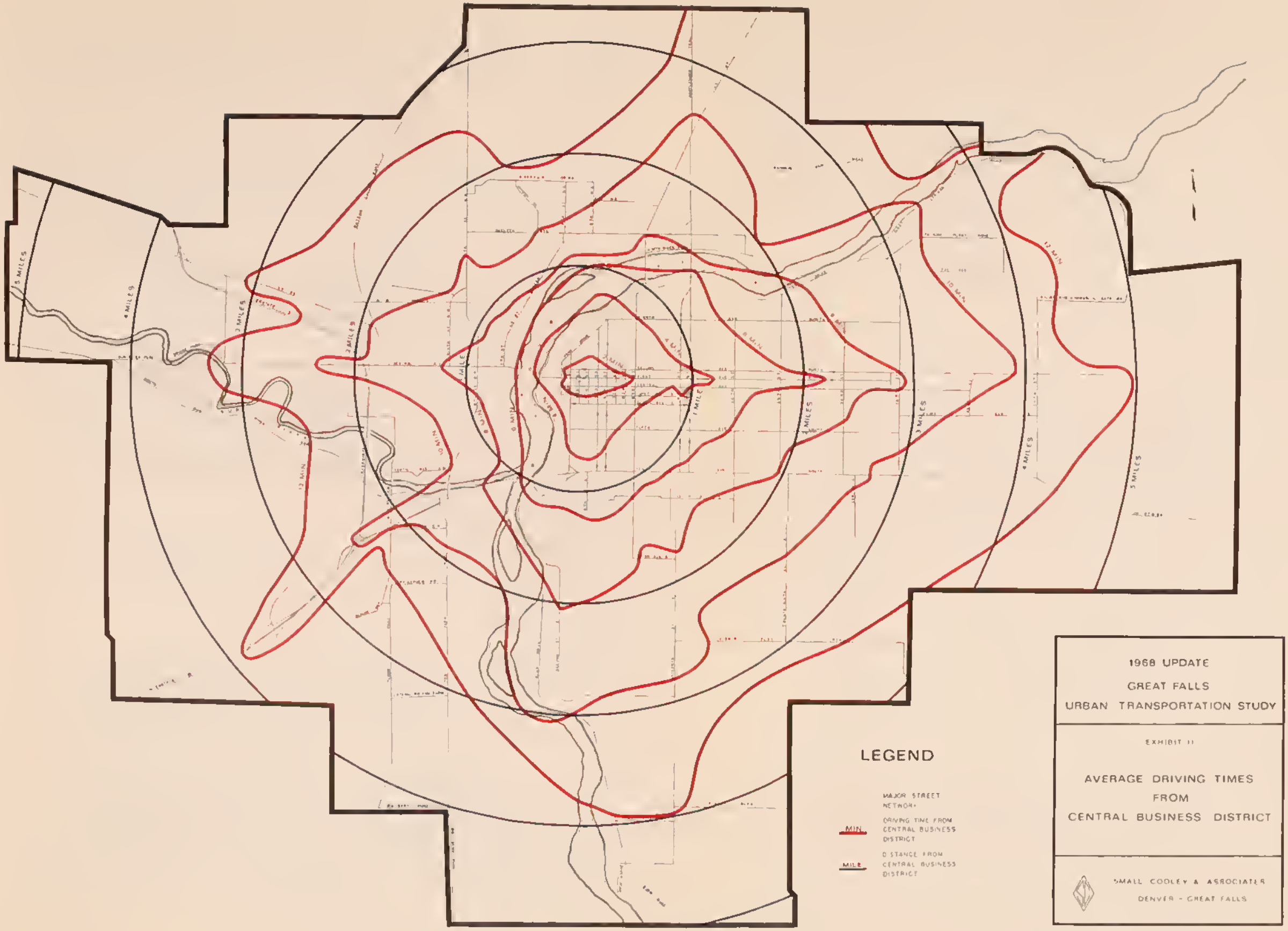
Travel time studies were made on all portions of the major street system. The data were obtained by actually driving the system and recording by stop watch the time between predetermined control points. A number of runs was made on each link of the system during both peak and off-peak hours. By averaging the results of the individual runs the average travel time on any given route was determined.

The results of the 1968 travel time studies are summarized in graphic form in Exhibit 10, which shows the average speeds that were attained on the major street system in Great Falls. There is little variation from speeds determined for the peak hour in 1961. The main areas of congestion are those within, or near, the Central Business District. In the areas of congestion the speeds dropped considerably, and in many cases were below 10 miles per hour during the peak-hour period between 4:30 P.M. and 5:30 P.M.

One of the purposes of this Study is to suggest ways to reduce to a minimum undue delays due to traffic congestion and thereby save time and money for the traveling public.

DRIVING TIME AND DISTANCE FROM THE CENTRAL BUSINESS DISTRICT:

The Central Business District of Great Falls is the main attractor of auto trips in the Study Area. Exhibit 11 portrays the travel time between the Central Business District and other parts of the Transportation Study Area. The beginning point utilized in the


5 MILES
4 MILES
3 MILES
2 MILES
1 MILE
10 MIN.
8 MIN.
6 MIN.
4 MIN.
2 MIN.
LEGEND
MAJOR STREET NETWORK
MIN. DRIVING TIME FROM CENTRAL BUSINESS DISTRICT
MILE DISTANCE FROM CENTRAL BUSINESS DISTRICT
1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY
EXHIBIT 11
AVERAGE DRIVING TIMES
FROM
CENTRAL BUSINESS DISTRICT
SMALL COOLEY & ASSOCIATES
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preparation of this exhibit was the intersection of 1st Avenue North and 3rd Street. The average driving time utilized was that determined from the travel time studies previously discussed.

VOLUME-CAPACITY ANALYSIS:

An analysis of the capacity of the signalized intersections within the Study Area was conducted to determine deficiencies in their physical design and operations. The capacities were also used during the trip distribution and assignment phases of this Study to determine the points where assigned volumes exceeded capacities.

The capacity[1/] analysis procedures, as developed by the Committee on Highway Capacity, Highway Research Board of the National Academy of Sciences, were used extensively. The techniques, as proposed by Jack E. Leisch in his article in Volume 34, Nos. 9 and 10 of "Public Roads - A Journal of Highway Research", were also used.

The capacity found for any one intersection depends heavily on the timing of the traffic signal, traffic volumes, turning movements and the physical dimensions of the approaches and parking conditions. Other factors which are considered are the location of the intersection within the City and the population of the City. The physical and signal phasing conditions which were used in the analysis were obtained during the signal inventory phase during the winter of 1967-1968. The traffic volume data which were used were gathered by the Montana Highway Department in the fall of 1967 and summer of 1968.

The results of the capacity analysis are shown on Exhibit 12. This illustration portrays the traffic volumes and capacities of major intersections. At 22 locations the present traffic volumes are approaching or exceeding the calculated capacity.

TRAFFIC ACCIDENTS:

The expanded 1968 Study Area contains 62 additional accident control sections and 68.2 additional miles of streets on the updated major street network. Other major changes have occurred on the network, such as the construction of the 15th Street Bridge and the Northwest By-Pass.

For these reasons, a direct comparison cannot be made of accident statistics within the 1961 and 1968 Study Areas. Therefore, the 115 control sections of the 1961 network were compared with

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1/ Capacity calculations were made assuming a Level of Service "C", as defined in the Highway Capacity Manual. A sample calculation is shown on page 95.

EXHIBIT 12

PRACTICAL CAPACITIES AND TRAFFIC VOLUMES

the same sections in 1968 and some meaningful results were obtained.

A comprehensive tabulation of accident reports of the City Police Department and Montana Highway Patrol was conducted in much the same manner as was done in the Base Year Study. Each accident occurring on the 1968 major street network for the three-year period of 1965-1967 was tabulated. Statistics as to location, cause, and severity were recorded and subsequently analyzed.

The following table compares total accidents occurring on the 115 control sections of the 1961 network for the three-year periods of 1960-1962 (base year) and 1965-1967 (update year).

NUMBER OF ACCIDENTS
1961 STUDY AREA
(115 Control Sections)

Year	All Streets and Highways	Major Street Network	Percent on Major Network
1960	2,257	1,565	69.3%
1961	2,323	1,656	71.3
1962	2,619	1,820	69.5
Total	7,199	5,041	70.0%
1965	2,619	1,753	66.9%
1966	2,523	1,605	63.6
1967	2,584	1,684	65.2
Total	7,726	5,042	65.3%

The following table compares total accidents within the Study Area for the three-year period of 1965-1967 to those occurring on the 1968 major street network.

NUMBER OF ACCIDENTS
1968 STUDY AREA

Year	All Streets and Highways	Major Street Network	Percent on Major Network
1965	2,659	1,882	70.8%
1966	2,553	1,695	66.4
1967	2,627	1,803	68.6
Total	7,839	5,380	68.6%

In comparing accidents for the two networks, it can be seen that the expanded Study Area and network added only 113 accidents for all streets and highways, as compared to 338 additional accidents for the major street network.

INJURIES:

Beginning in 1965, a new standard accident investigator's form was put into use by the Great Falls City Police Department. This form categorized injuries by the three following types:

Type A - Visible signs of injury, such as bleeding wound or distorted member, or had to be carried from scene;

Type B - Other visible injury, such as bruises, abrasions, swelling, limping, etc.; and

Type C - No visible injury, but complaint of pain or momentary unconsciousness.

Prior to 1965, a less comprehensive reporting form was used in which only the more serious type injuries were recorded. This resulted in the recording of lower injury rates within the City of Great Falls for the three-year period of 1960-1962.

In gathering data for the present survey, only Type A and Type B injuries have been used.

The following table shows the number and type of accidents in relation to severity on the major street network.

ACCIDENTS BY TYPE - 1968 MAJOR STREET NETWORK

Year	Total Accidents Reported	Accidents Involving Death	Accidents Involving Injury	Percent of all Accidents Involving Injury or Death
1965	1,880	4	207	11.2%
1966	1,694	5	225	13.6
1967	1,803	4	245	13.8
Total	5,377	13	677	12.8%

In comparing the three-year periods and their respective networks we note a reduction from 17 fatalities (1960-1962) to 14 fatalities (1965-1967). A like comparison for injuries shows a marked increase from 242 to 677.

TABLE NO. 9

RESULTS OF 1965-1967 ACCIDENT STUDY FOR SELECTED CONTROL SECTIONS

Sec. No.	Location	1965 - 1966 - 1967 Accidents				60-61-62 Total Accidents	65-66-67 Inj.Rate*	60-61-62 Inj.Rate*	65-66-67 Total Accident Rate*	60-61-62 Total Accident Rate*
		Fatal	Injury	Other	Total					
	10th Avenue South									
13	Fox Farm Rd to 2nd St	0	13	50	63	36	8	3	38	28
102	2nd St to 5th St	0	5	50	55	39	5	10	59	102
103	5th St to 9th St	0	10	74	84	88	10	3	85	135
104	9th St to 15th St	0	32	253	285	173	27	6	238	158
105	15th St to 20th St	0	14	117	131	105	14	11	131	125
106	20th St to 25th St	0	12	83	95	56	10	4	78	72
107	25th St to 32nd St	0	16	111	127	80	13	2	103	80
108	32nd St to 38th St	1	6	53	60	32	8	8	67	67
109	38th St to 57th St	0	5	33	38	12	4	1	32	13
	Central Avenue									
74	Park Dr to 5th St	0	9	227	236	217	21	44	548	794
73	5th St to 9th St	0	8	188	196	226	19	20	470	641
	1st Avenue North									
61	Park Dr to 5th St	0	6	133	139	151	15	9	339	430
62	5th St to 9th St	0	4	82	86	103	11	8	229	282
	2nd Avenue North									
60	Park Dr to 5th St	0	4	51	55	72	16	4	221	315
59	5th St to 9th St	0	3	56	59	66	7	7	183	227
	Central West & 1st Avenue North Bridge									
9	6th St SW to Park Dr	0	31	259	290	440	19	10	177	306

* Per 10 million vehicle miles.

Summarized in Table No. 9 are results of the 1965-1967 accident study with comparisons of a selected series of control sections for the three-year periods.

ACCIDENT RATES:

The degree of safety attributed to a given section of roadway can be evaluated when the number of accidents for that section is related to the traffic volumes. In 1961 the accident rate was computed to indicate the number of accidents that occurred on each control section during a three-year period for each 10 million vehicle miles of driving.

Accident rates were calculated by applying the same formula which was used in the 1961 Study. This formula is:

$$R = \frac{A \times 10{,}000{,}000}{S \times Y \times 3\ (365)}$$

Where: R = Accident rate per 10,000,000 vehicle miles

A = Total number of accidents occurring on control section during three-year period

S = Length of control section in miles

Y = A.D.T. over control section for three-year period.

The average accident rate on the major street network in the present Study Area for the three-year period of 1965 through 1967 was 148.5 accidents for each 10 million vehicle-miles of travel. This compares with 144.2 accidents for each 10 million vehicle-miles in the three-year period of 1960 through 1962. Exhibits 13 and 14, respectively, show accident and injury rates, for the Major Street Network.

MAJOR INTERSECTIONS INVOLVING ACCIDENTS:

Listed in Table No. 10 are the 20 major intersections by total number of accidents listed by rank and by comparable rank in the earlier study.

These results indicate that 18.3% of all accidents on the major street network are occurring at the 20 top intersections and approximately 10.1% of all major network accidents occur at the top 10

LEGEND

ACCIDENT RATE PER 10 MILLION MILES

UNDER 148.5

148.5 TO 300.0

300.1 TO 500.0

OVER 500.0

1968 UPDATE

GREAT FALLS

URBAN TRANSPORTATION STUDY

EXHIBIT 13

ACCIDENT RATES

PER 10 MILLION VEHICLE MILES

1965-1967

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LEGEND

ACCIDENT RATE PER
10 MILLION MILES

- UNDER 10
- 10 TO 20
- 20 TO 100
- OVER 100

1968 UPDATE

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URBAN TRANSPORTATION STUDY

EXHIBIT 14

INJURY

ACCIDENT RATES

PER 10 MILLION VEHICLE MILES

1965-1967

SMALL COOLEY & ASSOCIATES

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TABLE NO. 10

20 MAJOR INTERSECTIONS BY TOTAL NUMBER OF ACCIDENTS

1965, 1966, 1967

	1965-1967 Rank	3-Year Total	Average No. Per Year	1960-1962 Rank (Top 10)
10th Ave. South & 9th St.	1	75	25	3
Central West & 3rd St.	2	69	23	1
10th Ave. South & 14th St.	3	61	20	
10th Ave. South & 13th St.	4	59	20	7
Central Ave. & 3rd St.	5	59	20	
Central Ave. West & 6th St.	6	52	17	2
10th Ave. South & 25th St.	7	52	17	
Central Ave. & 4th St.	8	50	17	9
Central Ave. & 2nd St.	9	49	16	
Central Ave. & 5th St.	10	49	16	
1st Ave. North & River Dr.	11	48	16	5
Central Ave. & 7th St.	12	48	16	
10th Ave. South & 2nd-3rd St.	13	47	16	
Central Ave. & 9th St.	14	45	15	
1st Ave. North & 9th St.	15	40	13	
Smelter Ave. & 3rd St. NW	16	40	13	
15th St. & River Drive	17	37	12	
1st Ave. North Bridge	18	35	12	
10th Ave. South & 15th St.	19	35	12	
Central Ave. & Park Drive	20	34	11	8
AREAS THAT OCCURRED IN TOP 10 RANKING OF 1961 BUT WERE ELIMINATED IN 1968				
1st Ave. North & Park Drive	24	32	11	6
Central Ave. & 6th St.	29	31	10	4
Central Ave. West & 9th St.	36	24	8	10

intersections. In 1965 through 1967 the top 10 intersections accounted for 7.4% of all reported accidents in the Study Area.

The top 10 intersections in 1960 through 1962 accounted for 13.3% of major network accidents and 9% of total Study Area accidents.

10TH AVENUE SOUTH:

The highest accident area is on 10th Avenue South from Warden Bridge to 57th Street. This area includes four of the top 10 accident intersections and accounts for 16.3% of all accidents on the 1968 major street network and 11.2% of all accidents in the Study Area. The 4.19 miles for this section comprises 2.94% of major network mileage.

In view of the heavy traffic volumes and high number of accidents on this important arterial street, all accidents for the area were analyzed in depth for a one-year period (1967) and tabulated in Table No. 11.

INJURY AND FATAL ACCIDENTS:

Exhibit 15 shows the number and location of all accidents involving injuries of type A or B for the period 1965-1967. The locations of the 13 accidents involving fatalities are also shown. The locations of these severe accidents receive priority in scheduling improvements on the major street network.

ACCIDENT COST:

An estimate presented in 1967 by the National Safety Council indicated that in-city and out-of-city traffic accidents occurring to Great Falls residents cost about $3,500,000 per year. This estimate included loss of earning power, medical and hospital expenses, cost of motor vehicle repair or replacement, and overhead cost of insurance.

SUMMARY AND RECOMMENDATIONS:

Although the total number of accidents and the overall accident rate have not increased appreciably during the period from 1961 to 1967, some areas stand out as being in need of major improvement to reduce the high cost and personal suffering caused by traffic accidents.

In addition to the physical improvement of signal systems, pavement markings, and regulatory signs in critical areas, higher levels of enforcement and driver education should also be a goal of the community.

TABLE NO. 11

ACCIDENTS BY TYPE FOR 10TH AVENUE SOUTH
(1967 Only)

Location	Accident Type											
	Angle	Head-On	Rear End	Side Swipe	Turning Movement	Parking	Non-Collision	Fixed Object	Pedestrian	Backing	Other	Total
2nd St Intersection	2	1	5	1	4	-	-	1	-	-	-	14
3rd to 5th St	1	-	3	1	3	-	-	-	-	-	-	8
5th St Intersection	-	-	9	-	3	-	-	-	-	1	-	13
6th St Intersection	-	-	3	-	1	-	-	2	-	-	-	6
6th to 9th St	2	-	6	-	4	-	-	2	-	1	-	15
9th St Intersection	2	-	13	1	7	-	-	1	-	1	-	25
9th to 13th St	4	-	15	1	3	-	-	2	-	1	-	26
13th St Intersection	-	-	15	1	3	-	-	3	-	-	-	22
14th St Intersection	6	-	15	-	2	-	-	1	-	-	-	24
15th St Intersection	3	-	11	1	2	-	-	4	-	-	-	21
15th to 20th St	3	-	8	3	11	-	-	6	1	5	-	37
20th St Intersection	1	-	4	-	1	-	-	1	-	-	-	7
20th to 23rd St	-	-	4	1	2	-	-	-	-	1	-	8
23rd St Intersection	2	-	-	-	1	-	-	1	-	-	-	4
23rd to 25th St	-	-	-	-	3	-	-	2	-	-	-	5
25th St Intersection	3	-	8	-	6	-	-	-	-	1	-	18
25th to 32nd St	5	1	8	1	12	-	-	4	1	3	-	35
32nd St Intersection	2	-	5	-	1	-	-	-	-	-	-	8
32nd St to 38th St	-	-	5	2	2	-	-	3	-	-	-	12
38th St to 47th St	-	-	3	1	1	-	-	-	-	-	-	5
47th St to 49th St	-	-	2	2	10	-	-	1	-	-	-	15
TOTALS	36	2	142	16	82	-	-	34	2	14	-	328
PERCENT	11.0%	.6%	43.3%	4.9%	25.0%	-	-	10.3%	.6%	4.3%	-	100.0%
No. Involv. Inj.	5	1	11	1	7	-	-	11	2	0	-	38
% Inj. for Type	13.9%	50.0%	7.7%	6.2%	8.5%	-	-	32.4%	100.0%	0%	-	11.6%

29.6% of the accidents occurred during night-time conditions.
23 of the 34 Fixed Object accidents involved a light pole on the median.

LEGEND

ACCIDENTS INVOLVING INJURIES

TYPE A

TYPE B

ACCIDENTS INVOLVING FATALITIES

1968 UPDATE

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EXHIBIT 05

ACCIDENTS INVOLVING

INJURIES & FATALITIES

1965 - 1967

SMALL COOLEY & ASSOCIATES

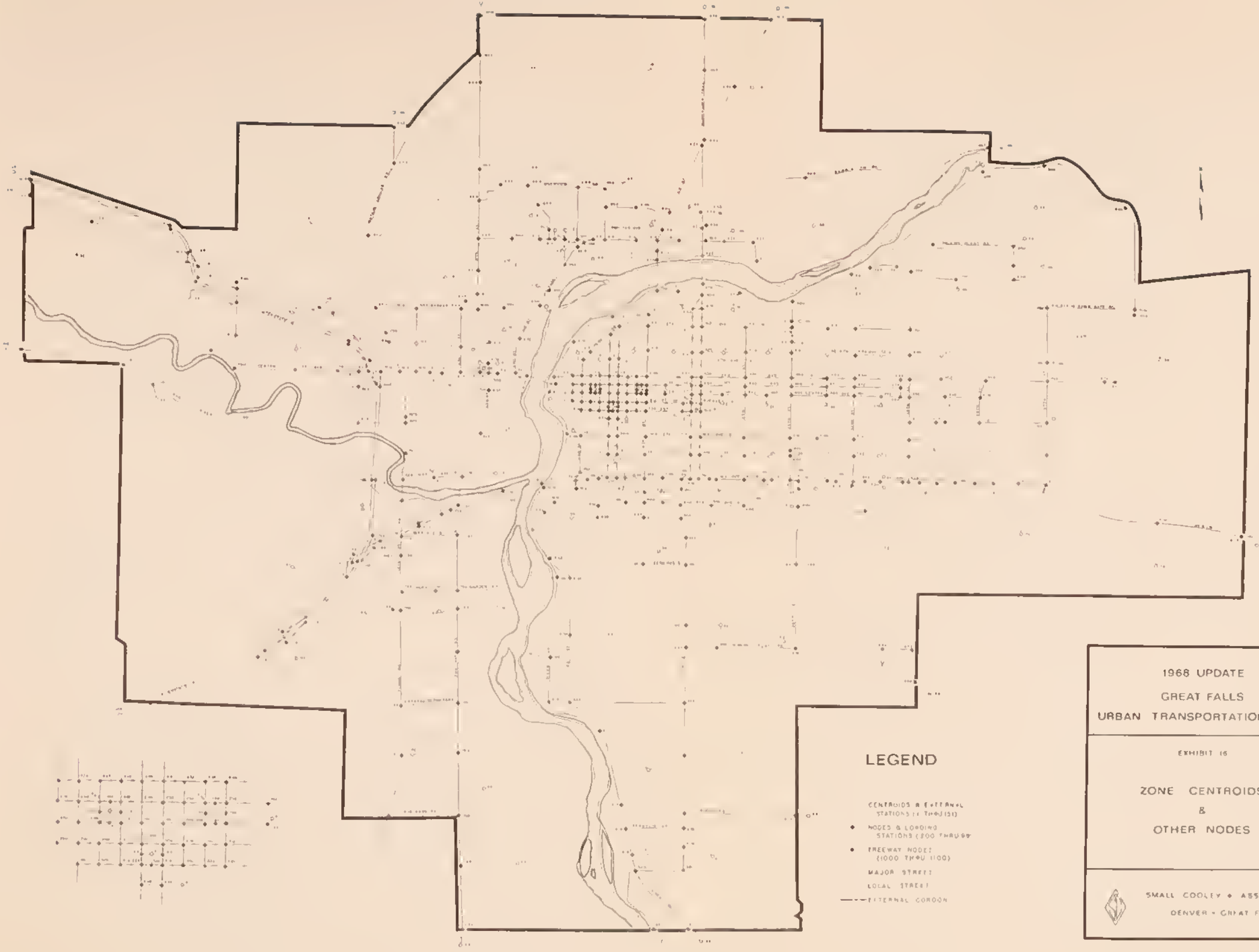
DENVER - GREAT FALLS

TRIP PROJECTIONS,

DISTRIBUTION,

&

PARKING STUDIES



1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 16

ZONE CENTROIDS
&
OTHER NODES

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CHAPTER 6

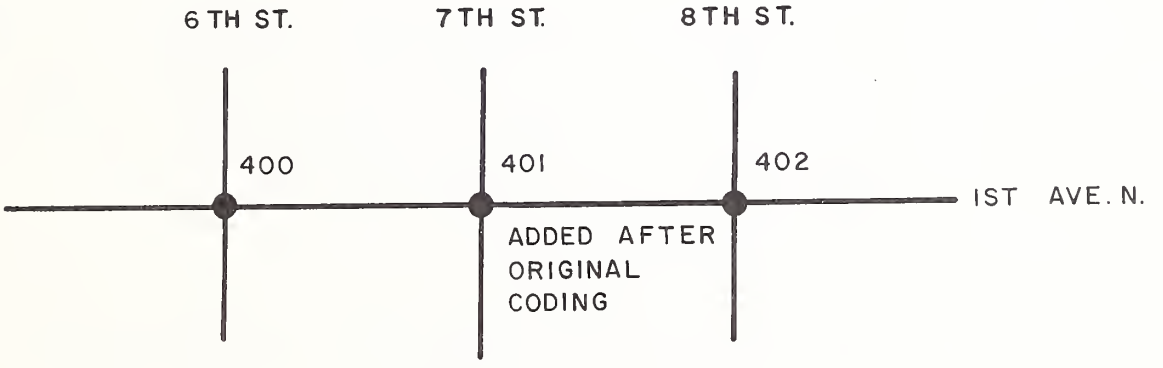
PREPARING THE NETWORK

GENERAL:

After the major street network had been selected and the study area defined, the network was prepared for computer processing with IBM 7090/7094 programs and equipment. Although this equipment differs from that used in the Base Year Study, the general methodology and end result remain the same.

THE NODE NETWORK:

The network as prepared for processing is that shown in Exhibit 16. Each internal zone centroid is numbered consecutively from 1 to 135 and the 16 external stations are numbered from 136 to 151 inclusive. All major network nodes were assigned numbers ranging from 200 to 999 using only even numbers throughout this range for the first try. Odd numbers were utilized in those cases where an additional node was added after the original coding of the network and were assigned numbers within the range of adjacent nodes to insure continuity of the node numbering system. For example:



Freeway nodes were handled in the same manner, but were assigned numbers from 1000 to 1100.

In addition to numbering all intersection points on the network, other nodes were placed where major streets crossed the city limits. These nodes were utilized to determine travel data for the various jurisdictions within the Study Area, such as total travel on City vs. County facilities, Federal Aid Systems in the City vs. Federal Aid Systems in the County, etc.

After all nodes were numbered in proper sequence and format, other link data, such as distance between nodes, speeds in m.p.h., turn prohibitors where applicable, and turn penalties for each allowable turn on the system, were added. All link data was then coded in proper format and key punched into data cards for subsequent processing.

SPECIFIC CONSIDERATIONS:

1. Bridge Impedance:

In the 1961 Study, a time factor of two minutes was added to each link which represented a bridge across the Missouri River for the purpose of balancing ground counts to synthetic trips from Gravity Model assignments. The same factor was retained for the present study and subsequent analysis has shown this impedance factor to be applicable for the 1968 network.

2. Turn Prohibitors:

Each turn that would normally be allowed by the physical makeup of the street system, but is forbidden under present regulations, was noted and coded into the system. The computer will not assign turns that are specifically prohibited.

3. Turn Penalties:

There is a time delay in most turning movements in any given system. To obtain realistic traffic assignments these delays must be accounted for in addition to the time required for the linear portion of any trip. A universal turn penalty of 10 seconds was assigned to account for this factor.

4. Intrazonal and Terminal Times:

Other factors that must be considered are the length of time required to travel from one point to another within a zone on streets other than those contained in the network and the time used at the end of the trip for parking and walking to the ultimate trip destination. These times vary depending upon the individual zone. The Central Business District has longer terminal times than a residential zone because the time required to park and walk to the destination is greater. Also a large zone in the suburbs would have a longer intrazonal time than a smaller zone in a more developed area served by better facilities. In general, the intrazonal and terminal times used in the update conform to those of the 1961 report except where zone boundaries or circumstances have warranted a change.

5. Centroid Connectors:

These are the links in the system that connect the hypothetical zone center to the major street network. In effect they represent all streets within the Study Area that are not accounted for on the major street network. Selecting the length and speed that is to be assigned to these links is a matter of judgment; the length being determined by the centroid location, and the time by circumstances associated with the particular zone. Analysis of the previous study showed that the values assigned for both speed and distance in most zones were valid and except for minor changes and the added zones, they remain unchanged.

CHAPTER 7

LAND USE AND SOCIO-ECONOMIC INVENTORIES AND PROJECTIONS

GENERAL:

The importance of accurate and current land use information for transportation planning was realized during the initial stages of the Great Falls Urban Transportation Study Update.

Manual methods used in the past to gather and tabulate this information have been cumbersome and time-consuming. For this Study, the Great Falls City-County Planning Board assembled land use information in proper format for data processing and utilized locally-available processing equipment to accomplish the necessary tabulation and analyses. Annual updating procedures have also been greatly simplified. Several other uses have already been found for this land-use data.

PRESENT LAND USE:

A tabulation of present land use within the Transportation Study Area was compiled from the Land Use Inventory. A complete listing of zonal characteristics was compiled. Summaries of Study Area totals for 1968 are as shown in Table No. 3 which compares totals between the Land Use Inventory and Origin & Destination Surveys for comparable items of information.

FUTURE LAND USE:

It was decided early in the Study to make traffic assignments for two specific future points in time, 1975 and 1990. The Great Falls City-County Planning Board projected pertinent land use data for each of these years.

Following are some statistics from the Planning Board 1990 projections for the Study Area.

Total persons	120,179
Total students	37,758
Total employed	47,220
Total dwelling units	35,883
Total automobiles	49,542
Average residential density	3.35

The above projections were determined on a zonal basis for the Transportation Study. These projections were then made for 1975, and also compiled on a zonal basis. Following are statistics from the Planning Board 1975 projections for the Study Area.

Total persons	83,542
Total students	25,134
Total employed	33,200
Total dwelling units	24,678
Total automobiles	33,113
Average residential density	3.38

These projections are basic in the determination of future trip productions and attractions for each of the Origin & Destination Zones and are thus a determining factor for travel within and through the Study Area for the years 1975 and 1990.

CHAPTER 8

TRIP GENERATION

GENERAL:

A great deal of effort was spent in trip generation analyses, to establish relationships between trip productions and attractions and land use and socio-economic factors. These factors, must, of course, be predictable for future years for the various analysis districts of the Study Area.

Care has been exercised in the selection of the independent variables to be used in the analysis. The criteria used in the selection are as follows:

1. Variables for which data were available for both the base year (1961) and the update year (1968);
2. Variables considered colinear would not be used in the same generation equation;
3. Variables used would be those that were predictable with a reasonable degree of accuracy through the target year (1990); and
4. The variables used would be analyzed for reasonableness.

The program utilized in the analysis contained in this report was that developed at U.C.L.A. and called the "BMDO2R Program." The program is quite versatile and has been found suited for use in trip generation analysis as related to the transportation planning process.

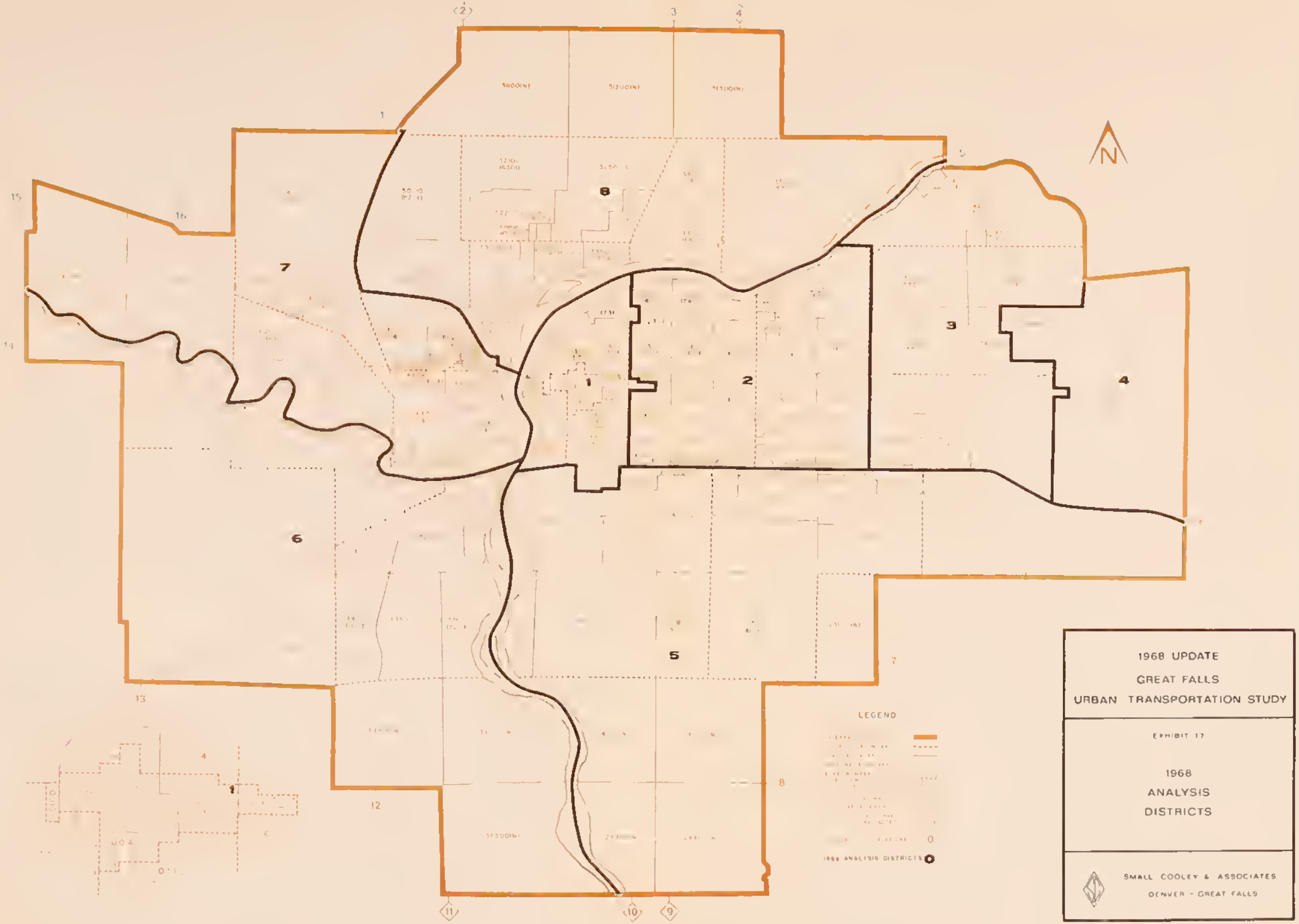
The equations that have been developed are expected to yield reasonable estimates of trip productions and attractions for the various analysis zones within the Study Area to 1990.

For this analysis, the 1961 and 1968 Study Areas were divided into 16 and 8 analysis districts, respectively. The 1968 Analysis Districts are shown on Exhibit 17.

Some zones within the Study Area contain special generators for which projections are made on an independent basis. Major shopping centers, the Airport, portions of the Central Business District, and other large industrial or commercial zones contain specific characteristics for which the equations may not be applicable. For these zones special generation rates are calculated from other records, and supplemental studies.

EQUATION DEVELOPMENT:

The entire process of equation development is the subject of a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1968 ANALYSIS DISTRICTS
1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY
EXHIBIT 17
1968
ANALYSIS
DISTRICTS
SMALL COOLEY & ASSOCIATES
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supplemental report entitled: "Trip Generation Analyses - Technical Report No. 2", and is too voluminous for inclusion herein.

After numerous trials the following equations and procedures were derived to predict the numbers of future trip productions and attractions.

1. Home-Based Work Trip Productions per Zone = 0.292 Occupied Dwelling Units per Zone + 0.838 Employees per Zone.
2. Home-Based Work Trip Attractions per Zone = 35.825 + 0.737 Employees per Zone.
3. Home-Based Other Trip Productions per Zone = 1.137 Occupied Dwelling Units per Zone + 1.677 Autos per Zone + 0.712 Students per Zone.
4. Home-Based Other Trip Attractions per Zone: No suitable equation was developed for this category. Projections were made on the basis of a growth factor of an appropriate independent variable depending upon the characteristics of the particular zone.
5. Non Home-Based Trip Productions and Attractions:
   A. For Residential Zones = 111.261 + 1.60 Dwelling Units per Zone + 2.308 Employees per Zone.
   B. For Commercial Zones = 597.173 + 4.370 Employees per Zone.
   C. For Industrial Zones: A growth factor method of projection was used, based on past trends and projected industrial development.
6. Internal Truck Trip Productions and Attractions = 132.59 + 0.754 Employees per Zone + 0.632 Dwelling Units per Zone.
7. External Trip Attractions per Zone = 52.084 + 0.499 Employees per Zone + 0.214 Dwelling Units per Zone.
8. External Trip Productions from External Stations: A growth factor method of projection was used, based on past trends at each external route entering the Study Area.

VARIABLES USED IN DEVELOPMENT OF EQUATIONS:

Data available from the base year and update studies provided information for testing a total of 17 independent variables. After several program runs, this list was substantially reduced through a process of elimination of variables not meeting necessary statistical criteria. Additional variables were dropped from future testing because they involved characteristics that would be difficult to project with any degree of accuracy. The independent variables used in final development were:

1. Population;
2. Number of Dwelling Units;
3. Number of Employees;
4. Number of Students; and
5. Number of Autos.

APPLICATION OF EQUATIONS:

Following the completion of regression analyses the developed equations were applied to both the 1975 and 1990 land use and economic projections compiled by the Great Falls City-County Planning Board. The results produced a table of productions and attractions for each zone within the Study Area for later use in Gravity Model application. Table No. 12 shows a listing for 1968, 1975 and 1990 of the various individual variables used in future projections for the total Study Area.

TABLE NO. 12

COMPARISONS OF VARIABLES USED IN TRIP GENERATION
FOR 1968 - 1975 - 1990

Variable	1968	1975	1990
Population	78,884	83,542	120,179
Dwelling Units	23,354	24,678	35,883
Employees	31,008	33,200	47,220
Students	23,585	25,134	37,758
Automobiles	30,501	33,113	49,542

CHAPTER 9

GRAVITY MODEL CALIBRATION

GENERAL:

The gravity model method of distributing trips was utilized in this Study because this method was used in the 1961 Study and is a well-documented procedure.

The gravity model method utilizes an equation and can be calibrated or adjusted whereby the computer will simulate the travel patterns in any urban area. Travel patterns can thus be predicted for future years for which reliable land use and socio-economic forecasts are available.

A separate equation must be developed or calibrated for each trip purpose which exhibits a dissimilar trip distribution pattern. In the 1961 Study, four gravity model equations were calibrated. These equations were for home-based work trips, home-based other trips, non-home based trips (which included trucks, taxis, and all external trips) and a separate equation for all internal and external truck trips. During the 1968 Update Study no origin and destination data were collected on internal truck travel but comparable data were collected for all of the other 1961 trip purposes. Therefore, it was necessary to separate out the truck trips from the non-home based gravity model equation in the 1961 data.

During the 1968 Update Study it was planned to collect only sufficient data to check and update the 1961 gravity model. Because of this, the following update procedure was used:

1. Use 1961 origin and destination data to select which trip purposes should have separate gravity model equations developed;
2. Use 1961 origin and destination data to develop the approximate travel time factor to "calibrate" the model and to develop specific adjustment, or "K" factors, if found necessary; and
3. Use the 1968 data to check the calibrated gravity model equations to determine if additional calibration is needed.

Technical Report 3, Gravity Model Calibration, describes the processes utilized in detail.

SELECTION OF GRAVITY MODEL TRIP PURPOSES:

In 1961 trips were broken into internal (those trips not crossing the external cordon line) and external trips. The internal trips were further broken into home-based work (HBW), home-based other (HBO), non-home based (NHB) which included taxis but not trucks, and internal trucks (Int Trk). The external trips were broken into external autos and taxi (Ext Auto) and external trucks (Ext Trk).

The trip length frequency distribution (TLFD) of each of these trip purposes was obtained and compared. The plots of each of these TLFD's are shown on Exhibit 18.

The 1961 Study Area was divided into 16 districts and the percent of trips attracted to each district was computed for each of the trip purposes. The results of this computation are shown on Exhibit 19.

It was desired to keep the internal truck trips in a separate gravity model so that the remaining trips could be checked with the 1968 origin and destination data. The five gravity model trip purposes utilized were (1) HBW, (2) HBO, (3) NHB and Taxi, (4) Int Trk and (5) Ext All.

CALIBRATION OF 1961 GRAVITY MODELS:

The HBW and HBO gravity models were utilized as calibrated in 1961. The NHB, Int Trk and Ext All trip purposes consisted of different trips or combinations of trips than were used in the 1961 Study. Therefore, the 1961 models could not be used as calibrated in 1961.

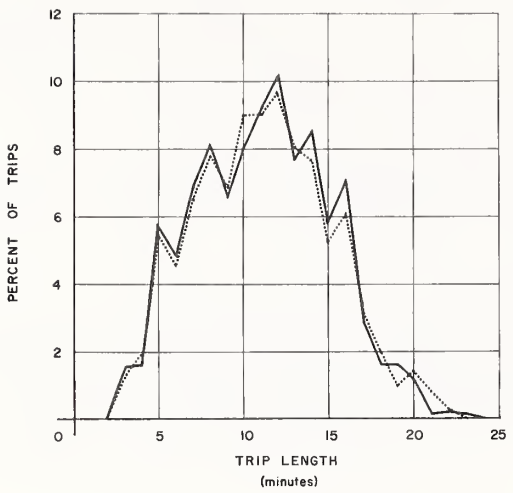
The calibration process consisted of first selecting "F" (friction or travel-time) factors which were felt to be reasonable, solving the gravity model equations, comparing the resulting trip movements and calculating the appropriate "F" factors to use in the next iteration.

During the calibration process it was found that the equations were not producing enough intra-zonal trips (those trips which did not leave the zone in which they originated). This discrepancy could not be corrected by the adjustment of the "F" factors until the intra-zonal travel times were reduced from three to two minutes.

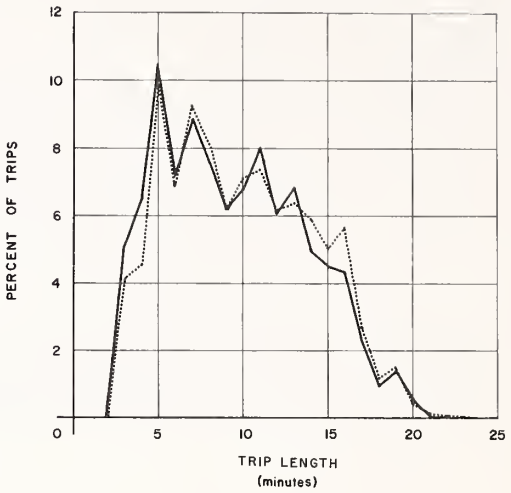
During the 1961 Study, it was found that a two-minute time penalty, or "bridge impedance" factor, was needed on each of the bridges crossing the screenline to produce the best results. In the recalibration done during the Update Study, the bridge impedance factor of two minutes was found to still be valid.

TRIP LENGTH FREQUENCY DISTRIBUTION CURVES

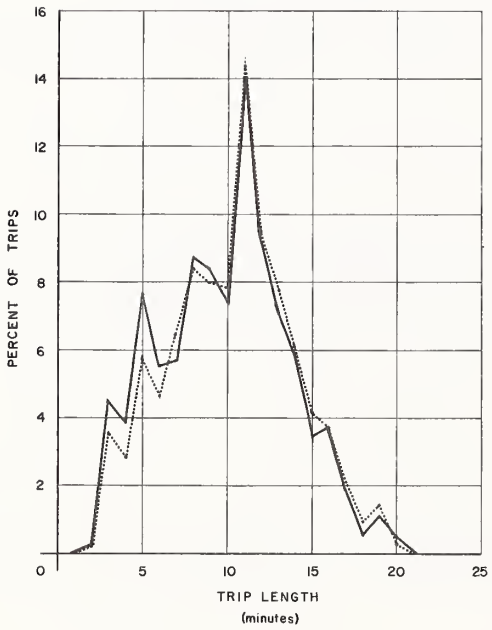
HOME BASED WORK



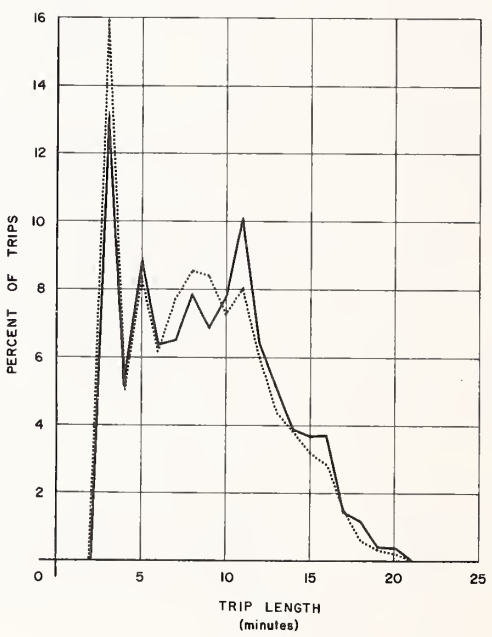
HOME BASED OTHER



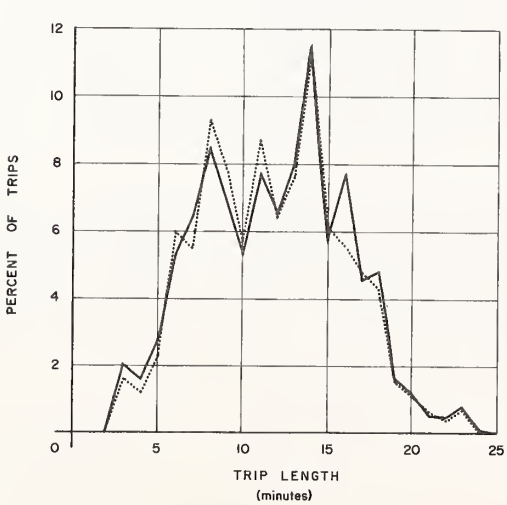
NON-HOME BASED



INTERNAL TRUCK



EXTERNAL TOTAL



ORIGIN AND DESTINATION 1961

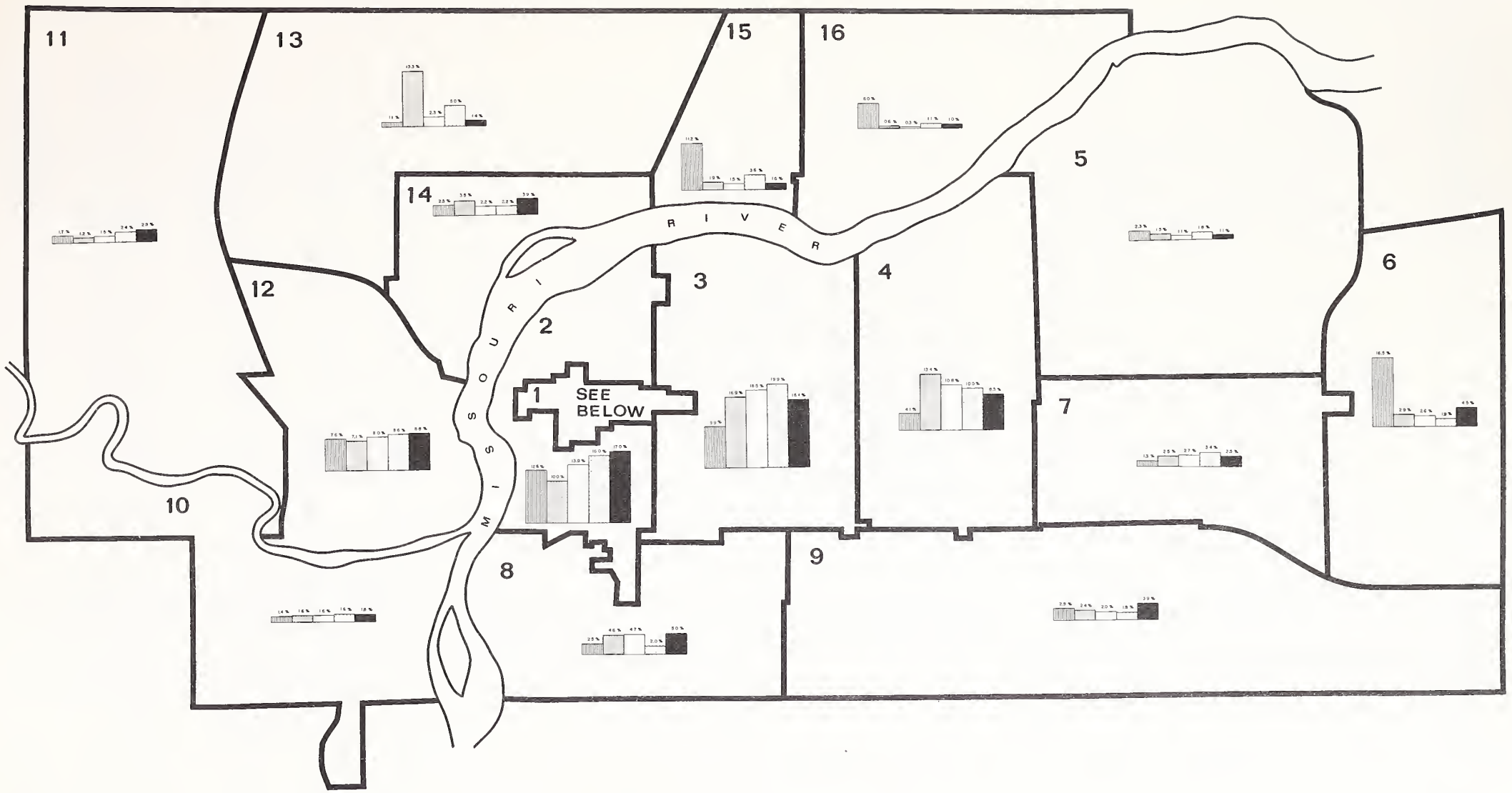
GRAVITY MODEL 1961

EXHIBIT 18

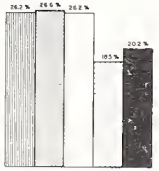
EXHIBIT 19

TRIPS ATTRACTED PER DISTRICT

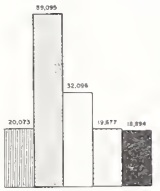
PERCENT BY PURPOSE

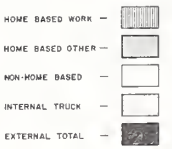


DISTRICT 1



TOTAL TRIPS





HOME-BASED WORK

(Purpose No. 1)

Trip Length	Final Friction Factor	1961 O & D % Of Trips	1961 Gravity Model % Of Trips	1961 O & D Accumulated % Of Trips	Gravity Model Accumulated % Of Trips
1	0	0.0	0.0	0.0	0.0
2	0	0.0	0.0	0.0	0.0
3	112	1.6	1.4	1.6	1.4
4	111	1.6	2.0	3.3	3.4
5	110	5.7	5.3	9.0	8.7
6	107	5.0	4.7	13.9	13.5
7	85	7.0	6.7	20.9	20.1
8	76	8.2	8.0	29.1	28.2
9	70	6.8	6.9	35.9	35.1
10	67	8.0	9.3	44.0	44.4
11	64	9.4	9.3	53.3	53.7
12	63	10.2	9.8	63.6	63.5
13	60	7.8	8.3	71.4	71.8
14	57	8.7	7.9	80.1	79.7
15	54	5.8	5.5	86.0	85.1
16	51	7.2	6.3	93.2	91.4
17	48	3.1	3.3	96.3	94.7
18	45	0.8	1.3	97.1	96.0
19	42	0.8	1.2	97.9	97.2
20	40	1.3	1.6	99.2	98.7
21	38	0.2	0.4	99.4	99.1
22	36	0.3	0.5	99.7	99.7
23	34	0.2	0.3	99.9	99.9
24	32	0.1	0.1	100.0	100.0
25	30	0.0	0.0	100.0	100.0

	1961 O & D	1961 GM
Total Trips	20,073	20,073
Intra-zonal Trips	222	231
Total Travel Time - Hours	3,698	3,729
Average Trip Length - Minutes	11.05	11.15

HOME-BASED OTHER

(Purpose No. 2)

Trip Length	Final Friction Factor	1961 O & D % Of Trips	1961 Gravity Model % Of Trips	1961 O & D Accumulated % Of Trips	1961 Gravity Model Accumulated % Of Trips
1	0	0.0	0.0	0.0	0.0
2	0	0.0	0.0	0.0	0.0
3	152	4.9	4.1	4.9	4.1
4	145	6.6	4.6	11.4	8.6
5	127	10.5	9.9	21.9	18.5
6	95	7.2	6.9	29.2	25.4
7	74	8.9	9.4	38.0	34.8
8	62	7.7	8.1	45.7	42.9
9	53	6.2	6.3	52.0	49.2
10	48	6.8	7.0	58.8	56.2
11	44	8.1	7.5	66.8	63.8
12	42	6.0	6.1	72.9	70.0
13	40	6.9	6.5	79.8	76.3
14	38	5.2	6.2	85.0	82.3
15	36	4.7	5.1	89.6	87.7
16	34	4.4	5.8	94.0	93.5
17	32	2.5	2.8	96.5	96.3
18	30	1.1	1.2	97.6	97.5
19	28	1.5	1.5	99.1	99.0
20	26	0.6	0.6	99.7	99.6
21	25	0.2	0.2	99.9	99.8
22	24	0.0	0.1	99.9	99.9
23	23	0.1	0.7	100.0	100.0
24	22	0.0	0.0	100.0	100.0
25	21	0.0	0.0	100.0	100.0

	1961 O & D	1961 GM
Total Trips	59,095	59,095
Intra-zonal Trips	2,108	1,760
Total Travel Time - Hours	9,429	9,793
Average Trip Length - Minutes	9.57	9.94

NON-HOME BASED

(Purpose No. 3)

Trip Length	Final Friction Factor	1961 O & D % Of Trips	1961 Gravity Model % Of Trips	1961 O & D Accumulated % Of Trips	1961 Gravity Model Accumulated % Of Trips
1	0	0.0	0.0	0.0	0.0
2	142	0.2	0.1	0.2	0.1
3	126	4.5	3.6	4.7	3.7
4	105	3.8	2.9	8.5	6.6
5	90	7.8	5.9	16.3	12.5
6	77	5.4	4.7	21.8	17.2
7	67	5.7	6.5	27.5	23.6
8	60	8.7	8.4	36.2	32.0
9	55	8.5	8.4	44.7	40.5
10	50	7.4	7.8	52.1	48.3
11	48	14.1	14.9	66.2	63.2
12	45	9.5	9.5	75.7	72.7
13	43	7.1	7.9	82.8	80.5
14	40	6.0	6.2	88.8	86.7
15	38	3.5	4.3	92.3	91.0
16	37	3.7	3.8	96.0	94.8
17	35	1.9	2.2	97.9	97.0
18	34	0.5	1.0	98.3	98.0
19	32	1.2	1.4	99.5	99.4
20	31	0.4	0.4	99.9	99.8
21	30	0.1	0.1	100.0	99.9
22	24	0.0	0.0	100.0	100.0
23	20	0.0	0.0	100.0	100.0
24	15	0.0	0.0	100.0	100.0
25	0	0.0	0.0	100.0	100.0

	1961 O & D	1961 GM
Total Trips	32,096	32,096
Intra-zonal Trips	2,195	2,164
Total Travel Time - Hours	5,300	5,522
Average Trip Length - Minutes	9.91	10.32

INTERNAL TRUCKS

(Purpose No. 4)

Trip Length	Final Friction Factor	1961 O & D % Of Trips	1961 Gravity Model % Of Trips	1961 O & D Accumulated % Of Trips	1961 Gravity Model Accumulated % Of Trips
1	0	0.0	0.0	0.0	0.0
2	0	0.0	0.0	0.0	0.0
3	560	13.0	14.7	13.0	14.7
4	198	5.1	4.7	18.1	19.4
5	137	8.8	7.7	26.9	27.1
6	101	6.3	5.9	33.2	33.0
7	78	6.6	7.2	39.8	40.1
8	63	8.0	8.3	47.7	48.5
9	52	6.9	7.9	54.6	56.4
10	43	7.8	7.6	62.4	64.0
11	37	10.3	9.3	72.7	73.3
12	32	6.6	6.7	79.3	80.0
13	28	5.2	4.7	84.5	84.7
14	25	3.9	4.2	88.5	88.9
15	22	3.8	3.7	92.2	92.6
16	20	3.9	3.5	96.1	96.1
17	18	1.5	2.0	97.6	98.1
18	16	1.2	0.8	98.8	98.9
19	15	0.5	0.7	99.3	99.6
20	13	0.5	0.2	99.8	99.9
21	12	0.1	0.1	99.9	99.9
22	11	0.1	0.0	100.0	100.0
23	10	0.0	0.0	100.0	100.0
24	9	0.0	0.0	100.0	100.0
25	8	0.0	0.0	100.0	100.0

	1961 O & D	1961 GM
Total Trips	19,677	19,677
Intra-zonal Trips	2,759	2,760
Total Travel Time - Hours	2,937	2,902
Average Trip Length - Minutes	8.96	8.85

EXTERNAL ALL

(Purpose No. 5)

Trip Length	Final Friction Factor	1961 O & D % Of Trips	Gravity Model % Of Trips	1961 O & D Accumulated % Of Trips	1961 Gravity Model Accumulated % Of Trips
1	0	0.0	0.0	0.0	0.0
2	84	0.0	0.0	0.0	0.0
3	69	2.0	1.4	2.1	1.5
4	60	1.6	1.2	3.7	2.6
5	54	2.8	2.4	6.5	5.0
6	49	5.4	5.6	11.9	10.6
7	46	6.3	5.4	18.1	16.0
8	43	8.5	8.8	26.6	24.8
9	41	7.0	7.8	33.6	32.6
10	39	5.5	5.5	39.1	38.1
11	37	7.8	8.9	46.9	47.0
12	35	6.6	6.4	53.5	53.4
13	34	8.0	7.9	61.4	61.3
14	33	11.4	11.5	72.8	72.8
15	32	5.9	6.6	78.7	79.4
16	31	7.7	6.2	86.4	85.6
17	30	4.5	5.1	90.9	90.8
18	29	4.7	4.8	95.6	95.6
19	28	1.6	1.6	97.2	97.2
20	27	1.2	1.2	98.4	98.4
21	26	0.6	0.6	99.0	99.0
22	25	0.3	0.2	99.2	99.2
23	24	0.7	0.7	100.0	100.0
24	23	0.1	0.1	100.0	100.0
25	22	0.0	0.0	100.0	100.0

	1961 O & D	1961 GM
Total Trips	18,894	18,894
Intra-zonal Trips	0	0
Total Travel Time - Hours	3,711	3,745
Average Trip Length - Minutes	11.79	11.89

EXHIBIT 20

The calibration process required several iterations on the computer, with the final iteration producing the results shown on Exhibit 20.

As a check on the need for "K", or specific adjustment factors, the gravity model trip movements were compared with their counterpart origin and destination survey trip movements. The zone to zone trip movements were first combined into 16 districts to facilitate the analysis. The difference between the origin and destination and the gravity model movements was checked against the allowable error of the 1961 sampling rate.

In order to determine which zone to zone trip movements were predominantly responsible for the apparent discrepancies, output from computer program TPDIFF 04, 13, 67 (comparison of origin and destination versus gravity model zone to zone trips by purpose) was analyzed.

The analysis provided the necessary information to select the zone to zone trip movements most responsible for the difference between origin and destination data and gravity model assignments. From this analysis it was decided to insert "K" factors for the zone to zone movements as outlined below:

From *Zones	To *Zones	HBW K Factors	HBO K Factors	NHB K Factor	Int Truck K Factor
49 & 50	49 & 50	0.001	0.001	0.001	0.001
53	50	0.250	3.170		
54	50	0.128	0.298		
102	135		1.070		
103	135		1.220		
121	122		0.570		
134	134		1.570		

* 1968 Zone Centroid Numbers

After the addition of the above "K" factors, the 1961 gravity model was calibrated within acceptable limits.

TESTING OF GRAVITY MODELS WITH 1968 ORIGIN & DESTINATION DATA:

To test the gravity model equations developed with 1961 origin and destination data, they were used to distribute 1968 trip productions and attractions.

A total of three trial runs was made. The first two trials were unacceptable because trips across the screenline at the four bridge locations were substantially over-assigned. In the third

trial, a series of "K" factors were included in the gravity model equation. After the addition of the "K" factors, the gravity model produced the following results.

SCREENLINE CROSSINGS BY BRIDGE

Bridge	Ground Count	3rd Trial Assignment
10th Avenue South	13,800	18,513
1st Avenue North	19,700	15,507
10th Street	7,000	6,434
15th Street	9,700	13,031
	50,200	53,485 (+ 6.54%)

SCREENLINE CROSSINGS BY TRIP PURPOSE

Purpose	Origin and Destination	3rd Trial Assignment
HBW	7,958	8,526 (+ 7.14%)
HBO	17,449	18,790 (+ 7.69%)
NHB	11,584	11,832 (+ 2.14%)
EXT	8,837	8,861 (+ 0.27%)

CHAPTER 10

PARKING STUDIES

The Parking Study Update is composed of two sections. Section A of this chapter deals with the Central Business District Study and Section B deals with the 10th Avenue South Study.

SECTION A

CENTRAL BUSINESS DISTRICT PARKING STUDY

GENERAL:

Any transportation study should consider parking facilities at major terminal locations. The Great Falls City Council in March of 1967 adopted off-street parking regulations which require new businesses to provide parking areas in relation to their size. Unfortunately, most of the businesses in the Central Business District have been in operation for many years and are unaffected. The Central Business District is still the largest single attractor of trips in the Great Falls Area. Therefore, adequate parking in this area is a prime concern.

The 1961 Parking Study included interviews of all parkers in the Central Business District to determine their destination and trip purpose. By comparing the available parking spaces to the parking demand it was found that in 1961 an additional 515 parking spaces were required. It was estimated that by 1981 an additional 950 parking spaces would be required.

PURPOSE AND SCOPE:

The purpose of the Update Study was to determine the status of parking in the Central Business District as related to changes in supply and demand between the base year of 1961 and the update year of 1968. It was not the intent of the Update Study to duplicate the 1961 comprehensive parking study. Information available from other elements of the Transportation Study Update was utilized, combined with some additional inventories. This information was then used to determine what changes, if any, would be necessary in the recommendations made in 1961.

The scope of the Update Study included the following items:

1. A cordon count of all vehicles leaving and entering the Survey Area and a determination by use of large-scale

aerial photography of all vehicles parked and in motion within the Survey Area for a predetermined peak hour;
2. A complete inventory of all available parking spaces within the Parking Study Area as defined in the 1961 Study;
3. An estimate of 1968 parking demands by comparing land use changes from 1961 to 1968; and
4. A determination, from expanded origin and destination data, of changes in those parking characteristics for which information was available.

STUDY AREA:

Since 1961 no major change has taken place in the Central Business District that would require revision of the Study Area boundary and it remains unchanged as shown on Exhibit 21. Also unchanged are the Core Area boundary and cordon station locations. These are also shown on Exhibit 21.

CORDON COUNT:

A cordon count of all vehicles entering and leaving the entire Survey Area was made at 28 locations on weekdays during the hours of 10:00 A.M. to 6:00 P.M. Vehicles were counted and classified at all locations into passenger cars, light delivery trucks, and other commercial vehicles. A total of 56,732 vehicles entered and left the Survey Area during the 8-hour period. This compares with 59,767 vehicles in 1961 - a decrease of 5.1 percent.

An inventory of vehicles parked and in motion was made by use of large-scale aerial photography. The photos were taken on a week-day during August of 1967 and July of 1968 at 2:00 P.M. At 2:00 P.M. on the photo taken on a week-day in July of 1968, there were 3,756 vehicles within the cordon area either parked or in motion. This compared with 3,021 total vehicles within the cordon area during the same period in 1961. Exhibit 22 shows graphically the results of the cordon count for 1968.

Vehicle accumulation within the cordon was calculated by use of cordon count information that was tabulated and classified in half-hour increments. This was then compared directly with information from the 1961 Study to indicate changes in traffic patterns within and through the Central Business District.

PARKING SUPPLY:

During August and September of 1967 the Montana Highway Commission, Planning Survey Section, conducted an inventory of all on-street and off-street parking spaces within the Parking Study Area.

EXHIBIT 21

PARKING SURVEY KEY

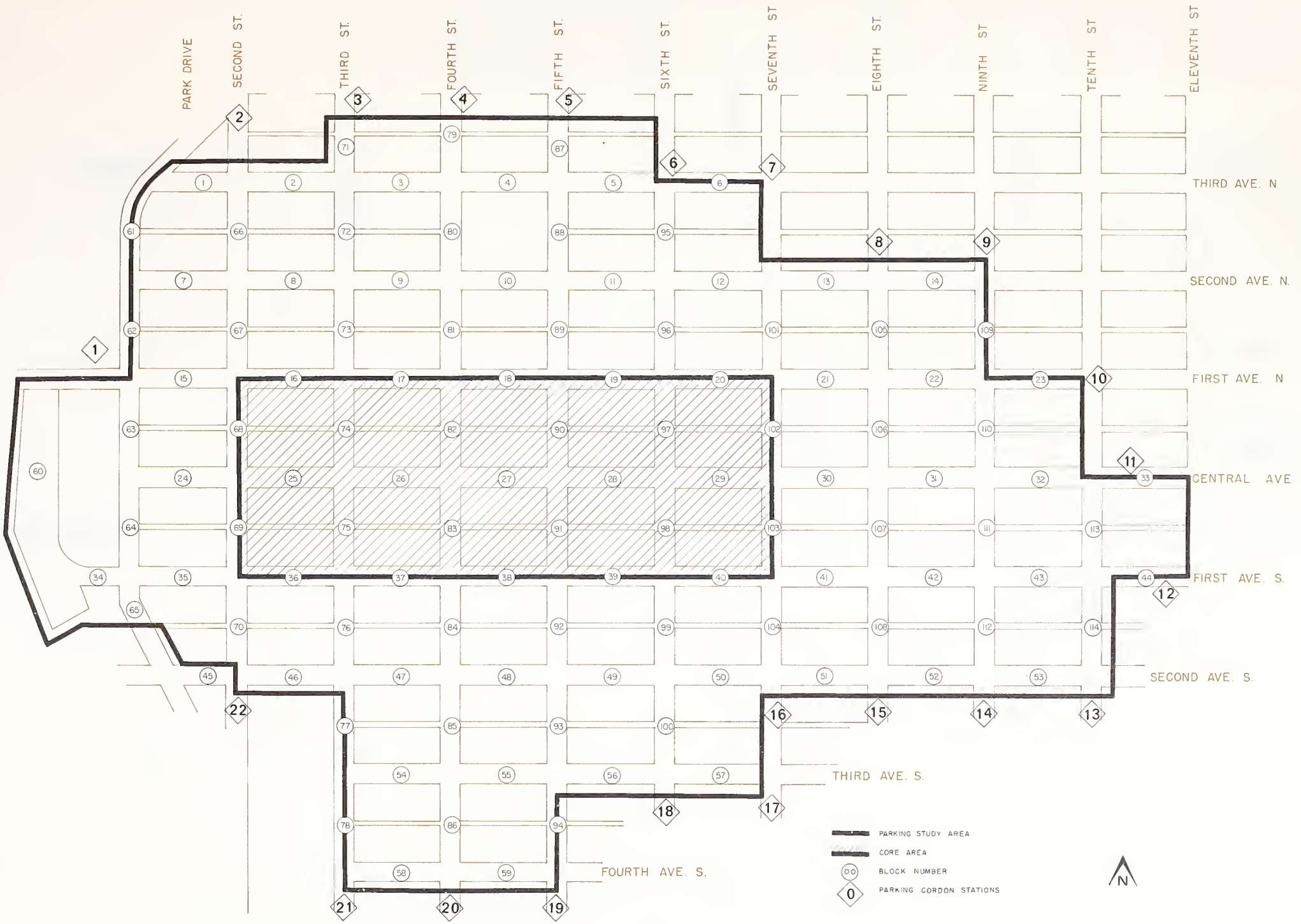
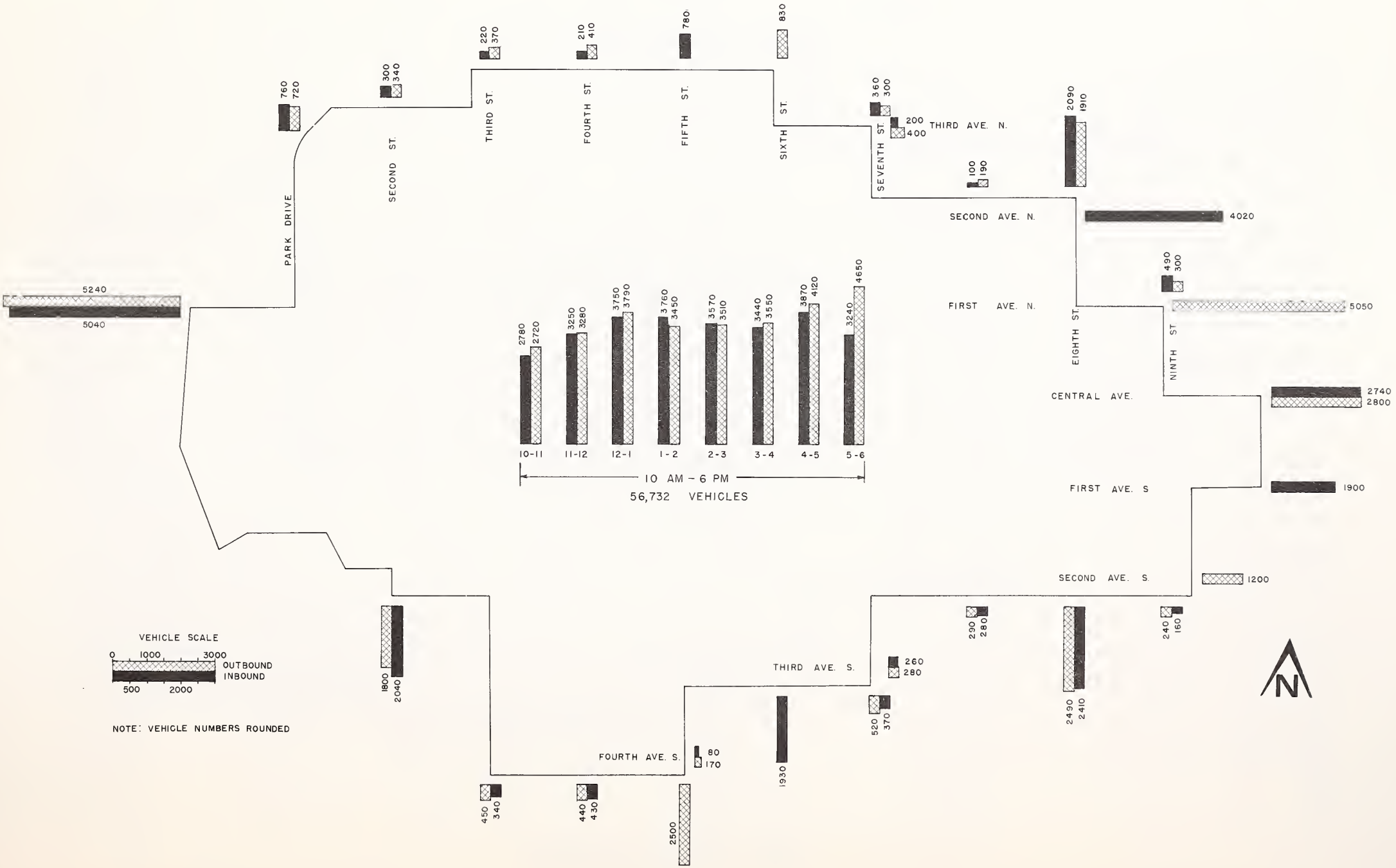


EXHIBIT 22

VEHICLES ENTERING & LEAVING SURVEY AREA

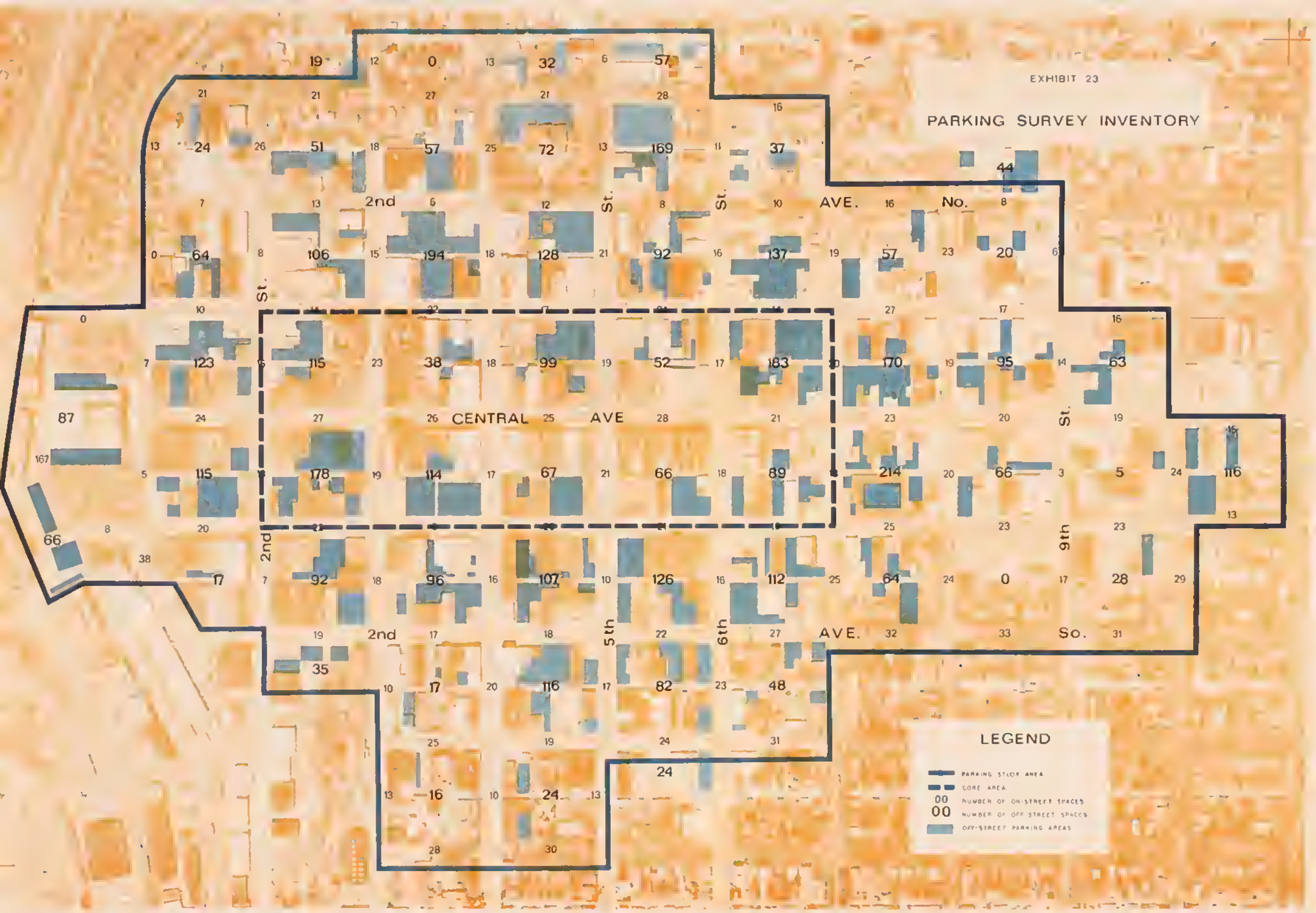
JULY 1968



NOTE: VEHICLE NUMBERS ROUNDED

EXHIBIT 23

PARKING SURVEY INVENTORY



A summary of these results is tabulated in Tables No. 13 and 14 for the entire Parking Study Area and Core Area, respectively. The number of curb spaces in the total Survey Area has decreased by 48 spaces (or 2 percent) while off-street parking has increased by 1,800 spaces (or 67 percent). The overall net difference between 1961 and 1967 is an increase of 1,752 spaces (or 36 percent).

The parking supply within the Core Area has increased by 434 spaces or 45 percent. Most of this increase was caused by the addition of off-street metered parking lots and park and shop facilities. There has also been a new parking garage constructed at 6th Street and Central Avenue.

PARKING DEMAND:

The 1968 parking demand in the Central Business District was next computed. Information from the origin and destination survey was checked against the cordon count, and the total demand was distributed to the individual block faces. Changes in land use from 1961 to 1967 were noted, and their individual effects on parking demand tabulated. Parking demand for individual types and sizes of businesses was calculated from 1961 Survey data and survey data in other cities.

Space-hours were used in comparing demand to supply. The total theoretical space-hours of supply were reduced by 10 percent for curb spaces and 15 percent in off-street facilities to allow for lost time in parking operations. The result was "practical" space hours of supply.

A walking distance of 350 feet was assumed as the maximum distance that people would walk from the place of parking supply to the final destination. This same distance and procedure was used in the 1961 Study. Parking spaces within a 350-foot distance of each block face were thus eligible.

The final tabulations showed that the only areas of major deficiencies occurred within the Core Area and were limited to Blocks 26, 27, 28 and 74, as shown in Exhibit 24. These four Core Area blocks, along with Block 24, also showed deficiencies in the 1961 Parking Survey. However, the deficiency in 1968 had dropped to a total of 204 parking spaces, compared to the deficiency of 451 spaces for the same blocks in 1961. The only block showing an increase in demand over supply was Block No. 74 which is affected by such heavy generators as the Rainbow Hotel, Great Falls National Bank, Davidson Building and the Post Office.

A considerable decrease in meter revenue was noted between 1961 and 1968. Although total revenues decreased, off-street meter

TABLE NO. 13

1967 PARKING INVENTORY SUMMARY AND COMPARISON

Total Survey Area:

	1961	1967
Curb Space		
12 minute meters	74	59
One hour meters	828	856
Two hour meters	264	228
Two hour Free	476	760
No restrictions	610	301
Total Curb	2,252	2,204
Lot Space		
Public Free	124	135
Public Pay	614	918
Private Free	1,120	1,785
Private Pay	695	1,405
Total Lot	2,553	4,243
Garage Space		
Public Pay	100	0
Private Pay	27	93
Private Free	0	144
Total Garage	127	237
Total Spaces	4,932	6,684
Total Space Hours	39,456	53,472

TABLE NO. 14

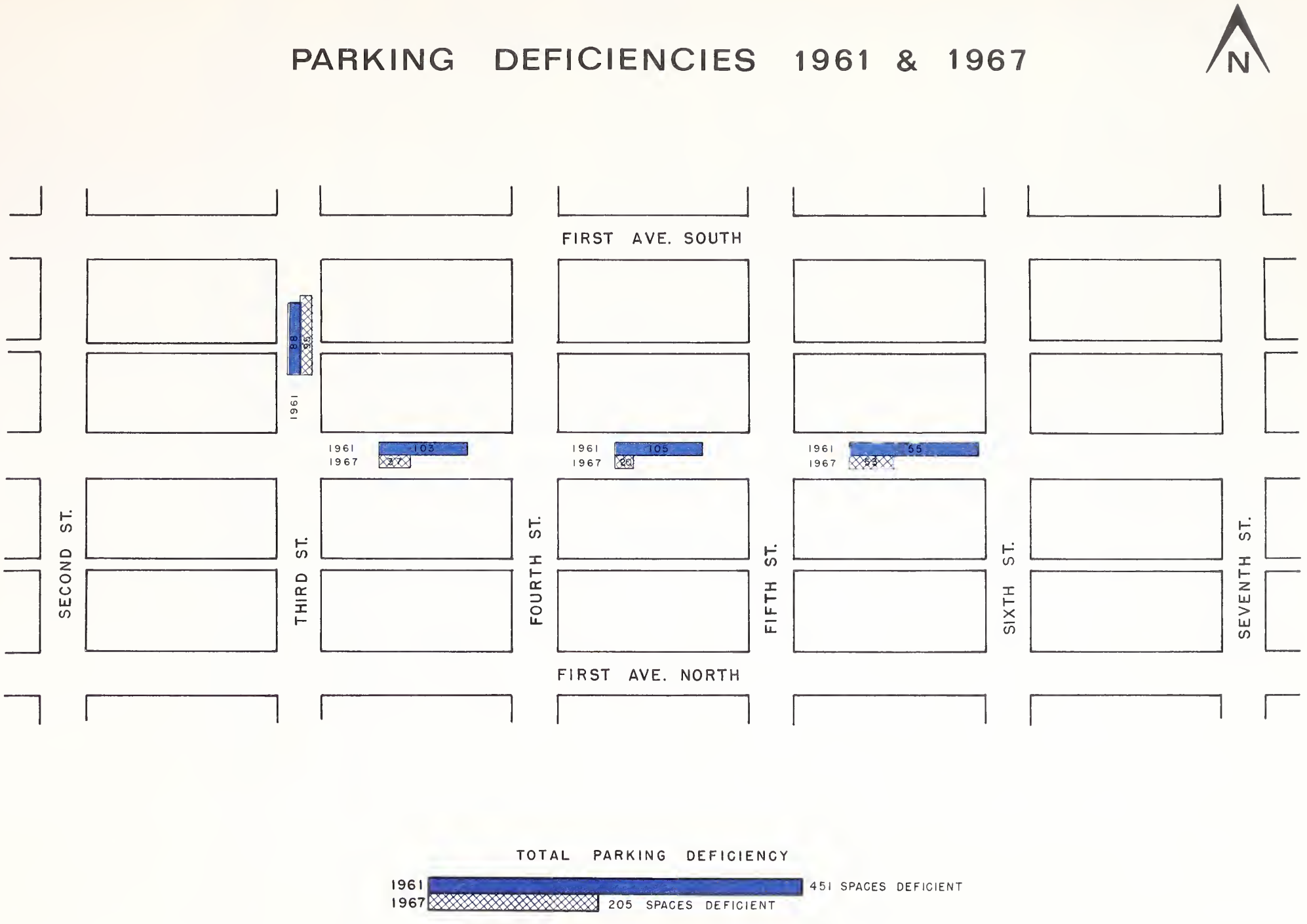
1967 PARKING INVENTORY SUMMARY AND COMPARISON

Core Area:

	1961	1967
Curb Space		
12 minute meters	15	18
One hour meters	375	369
Two hour meters	4	0
Two hour free	0	0
No restrictions	2	0
Total Curb	396	387
Lot Space		
Public free	0	0
Public pay	175	356
Private free	221	276
Private pay	162	318
Total Lot	558	950
Garage Space		
Public pay	0	0
Private pay	0	51
Private free	0	0
Total Garage	0	51
Total Spaces	954	1,388
Total Space Hours	7,632	11,104

EXHIBIT 24

PARKING DEFICIENCIES 1961 & 1967



revenues showed an increase while on-street meter revenues decreased sharply. A summary of meter revenue from 1963 to 1968 appears in Table No. 15. In analyzing these circumstances it becomes apparent that such things as the park and shop facilities owned and operated by local financial institutions, enactment of the Off-Street Parking Ordinance and provision of private off-street parking areas were having their effect. The Off-Street Parking Commission should be given special recognition in their efforts to provide parking in the excellent off-street facilities now in service.

Rapid redevelopment of the Central Business District has taken place since collection of data in 1968. Projects planned or under construction promise to show additional improvement of the parking problem.

PARKING CHARACTERISTICS:

In order to obtain information on parking characteristics a series of tables was prepared from origin and destination data utilizing parking linking and tabulating computer programs. These tables contain only trips for internal auto travel and do not include external or truck trips.

Since external travel and truck travel are not included, direct comparison with the 1961 Report cannot be made. The following items of information for internal auto and taxi travel give an indication of travel characteristics for 1968:

1. Origin of parkers;
2. Trips to the Central Business District by specific purpose;
3. Trips to the Central Business District by general purpose;
4. Type of parking utilized for each trip to the Central Business District;
5. Arrival time at the Central Business District for both parking type and trip purpose; and
6. Complete information on taxi trips destined to the Central Business District.

The tables shown in Exhibits 25 and 26 summarize the information available in this parking analysis. Exhibit 26 also shows the subdivision of the Central Business District by origin and destination zone.

TABLE NO. 15

BREAKDOWN OF METER REVENUE
Fiscal Year 1963-1964 through Fiscal Year 1967-1968

Off-Street Lots	1963-1964	1964-1965	1965-1966	1966-1967	1967-1968
1	$ 13,363.08	$ 12,868.49	$ 13,283.44	$ 12,886.03	$ 12,193.30
2	3,481.02	2,056.86	2,128.97	2,522.41	2,522.31
3	3,041.97	3,127.58	3,313.10	2,534.52	1,601.29
4	2,567.61	2,528.73	3,095.12	3,142.67	2,849.65
5	5,066.22	5,106.84	5,000.23	1,469.42	0.00
6	6,736.91	5,950.09	5,827.87	5,237.67	5,063.91
7	3,565.71	3,343.53	4,059.79	3,935.50	2,930.78
8	562.81	400.56	568.31	550.36	306.08
9	3,535.62	3,236.65	3,313.65	3,126.66	2,587.25
10	8,133.64	7,642.09	10,411.26	9,729.81	8,934.10
11	0.00	0.00	0.00	0.00	374.67
12	1,825.13	1,689.05	1,534.41	1,271.50	928.92
14	2,573.79	2,612.05	2,420.76	2,492.72	2,341.25
15	3,088.44	2,973.94	3,804.75	3,650.86	3,187.69
16	2,362.66	1,489.87	2,914.57	2,544.82	2,054.99
17	2,643.50	2,781.08	2,893.91	3,061.70	2,797.26
19	0.00	12.25	229.44	300.40	0.00
20	0.00	0.00	630.20	9,588.74	13,878.21
21	0.00	0.00	0.00	0.00	2,162.81
TOTAL LOTS	$62,548.11	$ 57,819.66	$ 65,429.78	$ 68,045.79	$ 66,714.48
On-Street Meters	91,113.04	91,755.40	93,172.57	87,599.48	82,754.83
TOTAL METER REVENUE	$153,661.15	$149,575.06	$158,602.35	$155,645.27	$149,469.31

PARKING TYPE TO TRIP PURPOSE

TOTAL PARKING AREA

TRIP PURPOSE

Parking Type	Work	Business	Med.	Social	Eat	Shopping	Serve Pass.	Home	Total Non Work	Total All Purposes
Street Free	1177	959	27	527	121	370	605	47	2656	3833
Street Meter	803	1296	134	140	47	2049	450	21	4137	4940
Lot Free	2525	741	54	308	47	571	240	89	2050	4575
Lot Paid	1235	343	59	159	27	321	47	26	982	2217
Garage Free	26	47	0	0	0	263	0	0	310	336
Garage Paid	229	0	0	0	0	0	0	0	0	229
Service	0	27	0	0	0	228	0	0	255	255
Residential	41	0	0	0	40	0	0	407	447	488
Cruised	21	148	0	355	0	55	0	0	558	579
TOTAL	6057	3561	274	1489	282	3857	1342	590	11395	17452

PARKING TYPE TO GENERAL PURPOSE

DESTINATIONS IN THE CBD

Parking Type	HBW	HBO	NHB	Total
Street Free	549	1544	1739	3832
Street Meter	292	2150	2497	4939
Lot Free	1443	1051	2081	4575
Lot Paid	718	699	799	2216
Garage Free	26	0	73	99
Garage Paid	87	0	143	230
Service	0	202	53	255
Residential	102	346	40	488
Cruised	0	113	465	578
TOTAL	3217	6105	7890	17212

ORIGIN OF PARKERS BY WORK & NON-WORK PURPOSES - 10 AM TO 6 PM

Origin	Work	Non-Work	Total
North & West of River	773	1912	2685
East of River & North of 2nd Avenue North	536	1674	2210
East of River & South of 2nd Avenue North	1486	3395	4881
Malmstrom Air Force Base	0	326	326
TOTAL	2795	7307	10102*

*Note: 24 hour total = 17210, or 8.1% of total internal auto driver trips with destinations in the CBD.

ORIGIN OF TAXI TRIPS - 10 AM TO 6 PM

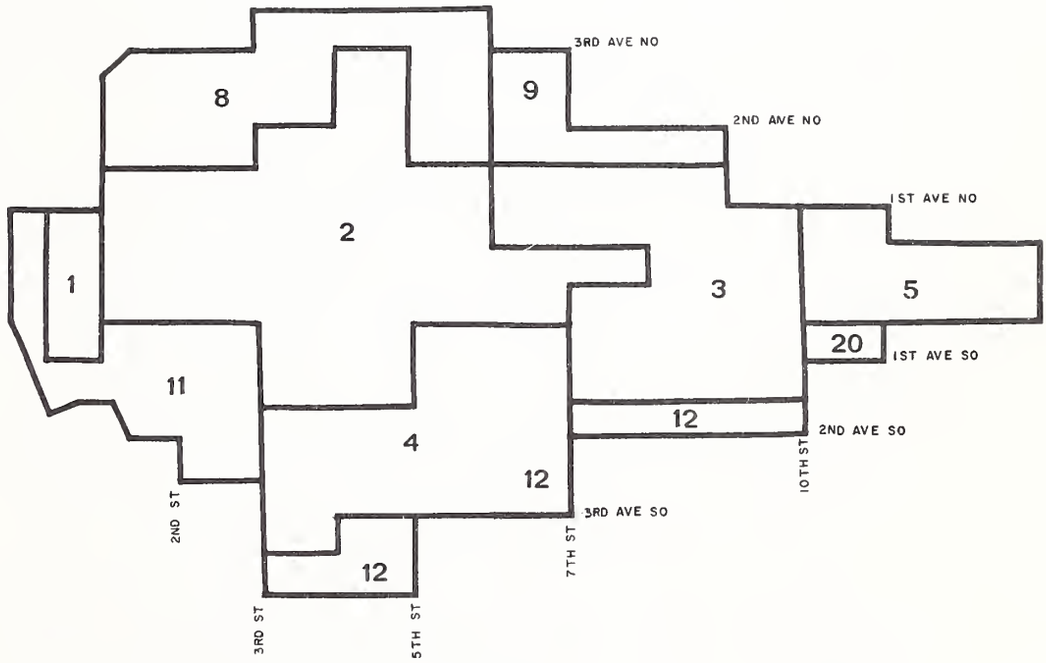
Origin	Trips
North & West of River	76
East of River & North of 2nd Avenue North	51
East of River & South of 2nd Avenue North	1
Malmstrom Air Force Base	116
TOTAL	244*

*Note: 24 hour total = 427 or 26% of all taxi trips had destinations in the CBD.

DESTINATION ZONE TO PARKING TYPE

Destination Zone	Parking Type									
	Street Free	Street Meter	Lot Free	Lot Paid	Garage Free	Garage Paid	Service	Residential	Cruised	Total
1	26	54	252	0	0	0	0	0	309	641
2	2149	3986	1762	1766	5	229	61	27	249	10234
3	708	358	1042	88	67	0	141	140	0	2544
4	424	285	698	121	26	0	0	73	0	1627
5	0	0	21	0	0	0	0	0	0	21
8	175	163	406	222	0	0	0	69	21	1056
9	121	0	27	20	0	0	27	108	0	303
11	174	94	368	0	0	0	26	0	0	662
12	54	0	0	0	0	0	0	73	0	127
20	0	0	0	0	0	0	0	0	0	0
TOTAL	3831	4940	4576	2217	98	229	255	490	579	17215

PARKING AREA BOUNDARIES



DESTINATION ZONE TO PURPOSE

Destination Zone	Trip Purpose									
	Work	Business	Med.	Social	Eat	Shopping	Serve Pass.	Home	Total Non Work	Total All Purposes
1	225	80	0	336	0	0	0	0	416	641
2	3619	2619	221	472	147	2347	755	53	6614	10233
3	706	317	0	302	47	779	266	125	1836	2542
4	707	228	27	133	47	259	153	73	920	1627
5	21	0	0	0	0	0	0	0	0	21
8	368	175	26	166	42	80	40	158	687	1055
9	62	27	0	26	0	0	80	108	241	303
11	348	113	0	27	0	153	21	0	314	662
12	0	0	0	27	0	0	27	73	127	127
20	0	0	0	0	0	0	0	0	0	0
TOTAL	6056	3559	274	1489	283	3618	1342	590	11155	17211

SECTION B

10TH AVENUE SOUTH PARKING ANALYSIS

Since 1961 numerous changes have occurred along 10th Avenue South from 4th to 57th Streets. A number of auto agencies has relocated to 10th Avenue South. Holiday Village, the largest single traffic generator along this avenue, has tripled in size. Many new restaurants have been established and motels have been added. A 270-bed hospital along with a medical clinic has been built in this area. Financial institutions have opened branch offices and professional people have established offices along 10th Avenue South. It has become a major business center for Great Falls and the surrounding area.

Along with the influx of new business, traffic volumes have shown a substantial increase and the need for adequate off-street parking is increasing.

In 1967 the City Council enacted an ordinance restricting all on-street parking along the entire length of 10th Avenue South from Warden Bridge to 57th Street. The traffic volume increases being experienced on this avenue left no alternate to this proposal and it followed recommendations of the 1961 Transportation Plan.

As previously mentioned, the City Council also passed another ordinance in 1967 which requires all new construction or change in occupancy to provide off-street parking areas.

On-site inspection and aerial photography were utilized to determine parking turnover and usage of off-street parking areas along 10th Avenue South. From these observations it was determined that off-street parking areas serving business establishments were of adequate size to handle the demand. The highest peak-hour that was observed occurred between 7:00 and 8:00 P.M., on Friday, December 20, 1968. Holiday Village Shopping Center attracted the most shoppers at this time and it was estimated that only 80 percent of all available parking space at Holiday Village was in use.

The entire 10th Avenue South complex contains a total of 30,831,000 square feet of land area and 3,580,000 square feet was specifically designated as off-street parking area as of August 1968. Total floor area within the complex amounts to approximately 1,760,000 square feet which yields a ratio of over two square feet of parking for each square foot of floor space for the entire complex.

From almost daily observations made throughout the Transportation Study Update, it appears that parking supply is being adequately supplied along 10th Avenue South under the City's off-street parking regulations. The following suggestions are made in regard to the Off-Street Parking Ordinance:

1. Specify within the Ordinance the minimum allowable area per parking stall;
2. Define the standards of surfacing of parking areas;
3. Provide more stringent controls on ingress and egress from parking areas adjacent to 10th Avenue South; and
4. Consider changing the allowable distance of the parking area from the business it is intended to serve.

In a recent extensive survey, the Urban Land Institute studied 270 shopping centers during the peaks of the pre-Christmas shopping season of 1964. The Institute's publication, "Parking Requirements of Shopping Centers", recommends the provision of 5.5 car parking spaces per thousand square feet of gross leaseable area. This standard accommodates the need for parking spaces at shopping centers for all but the ten highest hours of demand during an entire year. These ten highest hours occur during the three peak days of the year. At a relatively liberal gross parking area of 400 square feet per car, this results in a ratio of 2.2 (parking area) to 1 (gross leaseable floor area of retail business).

RECOMMENDATIONS

&

COSTS

CHAPTER 11

PLAN TESTING AND EVALUATION

GENERAL:

Before changes or additions are recommended for a given network system it is necessary to determine where deficiencies will appear in the system at a given date with projected traffic for that date assigned to the network. The point in time, or "design year" for this step has been defined as the year 1990 and the volumes of traffic that can be expected within the Study Area are based upon land use and economic projections to 1990. The basic network from which determinations of deficiencies will be made is that referred to as the existing plus committed network.

EXISTING PLUS COMMITTED NETWORK:

Prior to making any traffic assignments the existing major street network within the Great Falls Transportation Study Area was updated to include those improvements, revisions and additions that were either under construction or otherwise committed projects as of August, 1968. These include such projects as:

1. Improvement of 3rd Street Northwest from Central Avenue West northward and eastward to its confluence with Smelter Avenue and thence east on Smelter Avenue to its intersection with 10th Street along with improvement of connecting and adjacent facilities;
2. The implementation of a one-way couplet on 25th and 26th Streets;
3. Upgrading the 6th Street Southwest facility between the Sun River and Central Avenue West; and
4. Some additional improvements that could be expected as a result of the annexation policies and street-improvement programs of City, County and State agencies having jurisdiction within the Study Area.

The existing plus committed system is illustrated in Exhibit 27.

After this system had been defined, 1990 traffic was assigned to this system. The results of this assignment are shown on Exhibit 28 for the major traffic corridors serving the Study Area. Perhaps the most dramatic increase is that noted at various points along 10th Avenue South from its intersection with Fox Farm Road eastward to 25th Street. Other areas, of course, also show considerable traffic increases. By comparing this assignment with calculated capacities, problem areas that will obviously need revision or

LEGEND

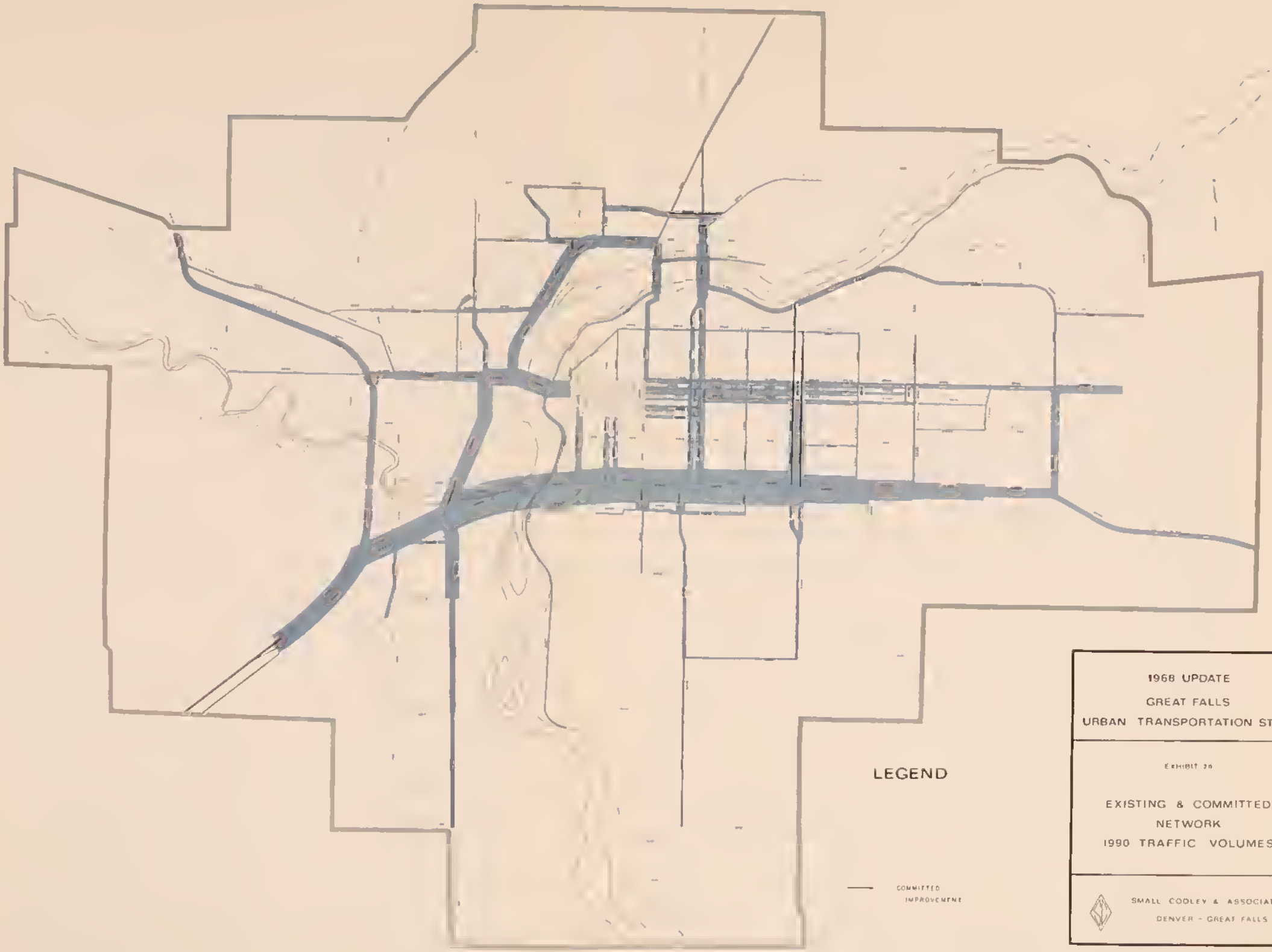
COMMITTED IMPROVEMENT

1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 27

EXISTING & COMMITTED
NETWORK

SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS



1968 UPDATE

GREAT FALLS

URBAN TRANSPORTATION STUDY

EXHIBIT 26

EXISTING & COMMITTED

NETWORK

1990 TRAFFIC VOLUMES

SMALL COOLEY & ASSOCIATES

DENVER - GREAT FALLS

improvement are isolated. For example, the assignment shows that under a "do-nothing" policy beyond the existing plus committed system, average daily traffic volumes will be in the neighborhood of 40,000 vehicles per day on 10th Avenue South at 9th Street. Calculations indicate that this volume of traffic is approximately 25% in excess of the volume that could be handled under "forced-flow" conditions, or Level of Service "F" as defined in the 1965 Highway Capacity Manual. This is the lowest of the six levels of service. Traffic would be severely stalled at peak-hour periods and the facility would no longer be effective as a major arterial street. A Level "C" service volume as defined in the Capacity Manual was selected for design purposes. In the case of Level "C" service the calculated capacity is 23,500 vehicles per average day resulting in a deficiency of 16,500 vehicles per day. The same situation prevails along much of the remainder of 10th Avenue South and the two-lane Warden Bridge over the Missouri River.1/

Similar calculations were made for other problem areas and improvements or alternate systems were designed to relieve the capacity deficiencies.

1990 ALTERNATE NETWORKS:

A series of three alternate networks were tested. The alternate networks tested are briefly described as follows:

Alternate Network No. 1:

The first network to be tested was one consisting of the existing plus committed network and the addition of a majority of the recommendations from the 1961 Transportation Plan. In addition, a number of other major revisions were included, such as:

1. An additional connection to the Interstate Spur west

1/ The Level "C" service volume of 23,500 vehicles per day was calculated on the basis of the following assumptions: (1) That all intersections along 10th Avenue South will have 60% of the signal time (green) assigned to the east-west movement; (2) The facility would be expanded to six lanes, all within the existing curbed roadway; (3) Left-turn phases of 20% maximum from 10th Avenue South to the side streets; (4) Facility will be carrying 5% trucks and buses; (5) There would be a maximum of 10% right turns off of 10th Avenue South to side streets; (6) Peak-hour directional split would be 60-40; (7) Peak-hour volume equals 10% of ADT. The calculated service volumes for "C" and lower are as follows: Level C - 23,500 ADT; Level D - 27,400 ADT; Level E - 29,000 ADT; and Level F - 30,700 ADT.

of Fox Farm Road;

2. Removal of the 10th Street Bridge across the Missouri River from its present location to a new location connecting the Northwest By-Pass across the River in the vicinity of Squaw Island to the 6th Street Underpass on River Road; and
3. An additional one-way couplet connecting the Central Business District to 10th Avenue South and to the eastern terminal of the new bridge.

The first major addition, providing additional access to the Interstate Spur in the vicinity of Fox Farm Road and Bridge Street, was tested in an effort to relieve the congested condition at the intersection of Fox Farm Road and 10th Avenue South. The present intersection provides the only access for a large area south of the Sun River and west of the Missouri River that is projected for very rapid growth in the next two decades. It was understood when including this revision that there were major design problems involved. The new connection would have to be made in an area of close proximity to a major interchange on the Interstate System and also would be in conflict with the Great Northern Railroad Mainline track between Great Falls and Butte. As a result, only half of a diamond interchange was provided, giving eastbound traffic a point of ingress and westbound traffic a point of egress from the Interstate Spur. This would involve two ramps, both connecting the Interstate Spur to Bridge Street, and would serve principally the movement of traffic to and from the areas south of the Interstate Spur. Included also in this revision was an improved connection from Bridge Street to the Sun River Road. This connection was provided to improve airport access to the northern boundary of the airport near the proposed new terminal site.

The next major revision involved relocation of the 10th Street Bridge. Recent surveys and analysis of this structure have been made by the Montana State Highway Commission. It was found that the structure, built in about 1920, was deteriorating badly and its structural condition was very questionable. As a result it was determined that this facility would have to be rebuilt in the near future if it were to continue to provide service to the community. Since the structure was to be rebuilt, it was decided to test a new location further upstream on the Missouri River in an area that would provide a more direct connection to the new Northwest By-Pass and also would serve more effectively the large and rapidly growing Riverview Area. A similar consideration was given in the 1961 Study but, at that time, it did not prove feasible. This, of course, was prior to the time that the structural condition of the 10th Street facility had been questioned.

The third major revision was to provide an additional one-way couplet on 2nd and 3rd Streets, which would better serve the Central Business District both from the south and the north. This couplet would terminate on the south at the proposed 10th Avenue South grade separation which was originally recommended in the 1961 Study. The couplet would terminate at the north in the vicinity of 8th Avenue North near the eastern terminal of the proposed new bridge as previously described. The inclusion of this couplet was necessary to handle Central Business District traffic volumes predicted for 1990.

When Interstate 15 was completed, the interchange located at Emerson Junction included only two ramps, which constitutes one-half of a diamond interchange. Since extensive commercial and industrial development is expected along U.S. 89, and on some Great Northern Railroad industrial property located in close proximity to this interchange, it was decided that an additional two ramps allowing full ingress and egress to the Interstate at this point would be tested. Since the Great Northern Mainline Track is located south of U.S. 89, making ramp construction impractical at that point, the ramps are proposed north of U.S. 89. Adequate undeveloped land is available and right-of-way acquisition poses no serious problems.

The first alternate tested included, in addition to the above, a majority of the recommendations of the 1961 Study, including:

1. Division Road extension from Smelter Avenue to U.S. 87 By-Pass;
2. 2nd Street South extension, including the grade separation at 10th Avenue South, revised to accommodate the new 2nd and 3rd Street one-way couplet;
3. Widening and improving 6th Street Northwest from Central Avenue West to the Northwest By-Pass to a 4-lane arterial;
4. 4th and 5th Avenues South one-way couplet from 3rd Street to 43rd Street; and
5. 24th Avenue South from River Drive to 26th Street.

Note: The above list includes only those recommendations of the 1961 Report that involve revisions or additions to the system that alter the network for traffic assignment purposes. They do not include the recommendations for widening or improving existing routes. These recommendations are discussed later in the report.

The existing plus committed network was updated to include the revisions outlined above and 1990 projected traffic was assigned to the system. Subsequent analysis showed that traffic volumes on 10th Avenue South, and in some areas of 6th Street Southwest were in excess of those that would allow a satisfactory design level of service.

Alternate Network No. 2:

To correct the deficiencies noted in Alternate No. 1, the network was again updated to include two major revisions as follows:

1. 24th Avenue South was extended across the Missouri River at a point midway between Park and Taylor islands to a connection at the Gore Hill interchange on Interstate 15. It was also extended east to the intersection of U.S. 87-91 in the vicinity of 57th Street; and
2. In an attempt to relieve the expected congestion on 6th Street Southwest from the Great Northern Underpass to Central West, a new route was included from the underpass, northerly and easterly from approximately 5th Avenue Southwest to the intersection of 3rd Street and Central Avenue West.

With these two additions, the network was again tested with expected 1990 traffic volumes. Analysis of results did show that a majority of the problem areas had been relieved to the point that the network was considered adequate to meet demands of the Study Area through the design period. However, the matter of airport access was again considered. As previously discussed under Alternate No. 1, this was to be provided by the proposed connection to the Interstate Spur at Bridge Street. The problems in making the connection proved to be so involved that upon recommendation of local and State officials another alternate was tried.

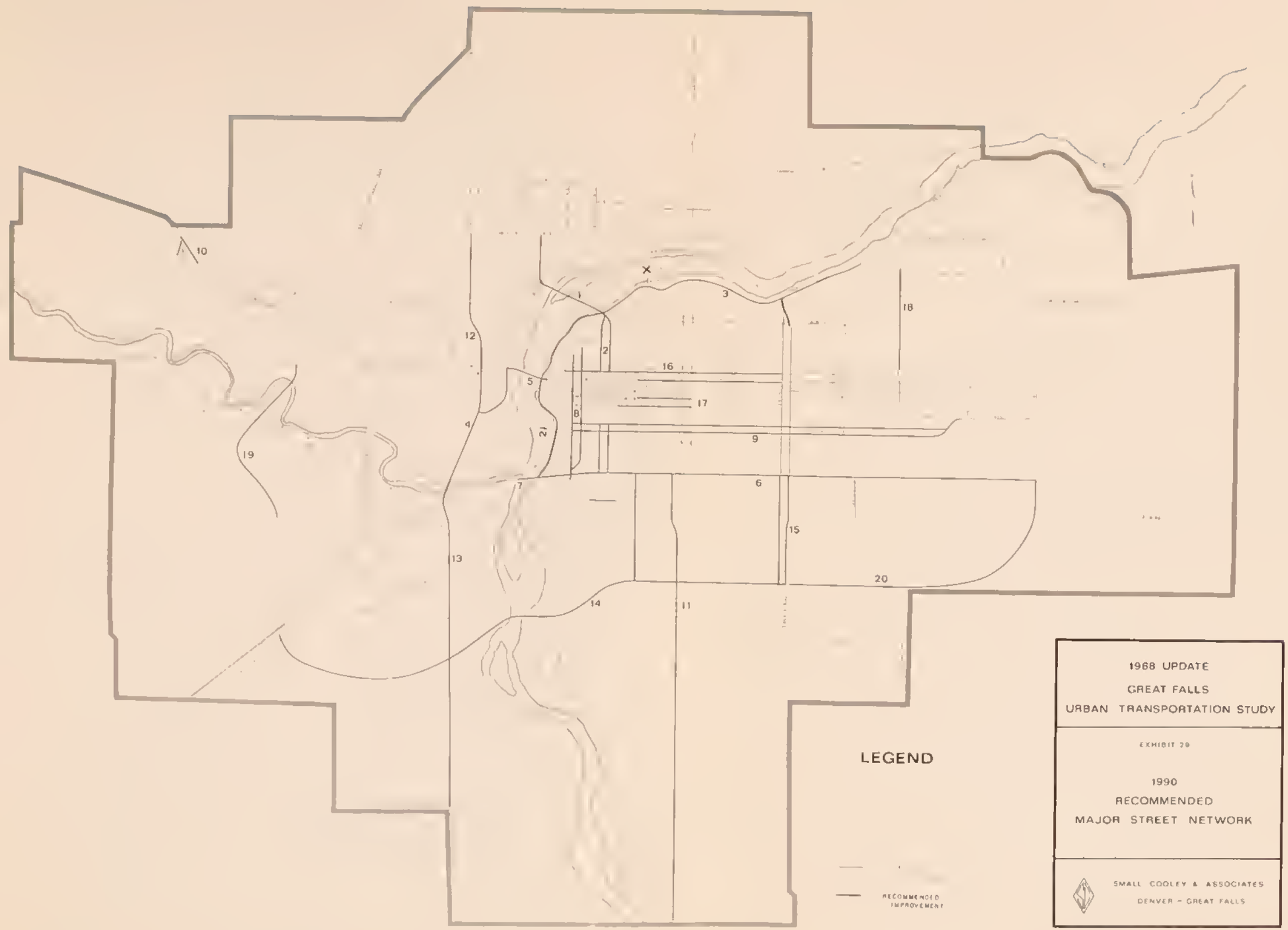
Alternate Network No. 3:

The only change from Alternate No. 2 in this assignment was that involving airport access. Provisions for movement of traffic from the Central Business District were made via Central Avenue West to approximately 24th Street Southwest, thence south across the Sun River and up the north slope of Gore Hill to the proposed terminal site. These changes were incorporated in the network and projected 1990 traffic was again assigned. Analysis of the results confirmed that the network was capable of fulfilling the major study objectives. It, therefore, becomes the recommended system. The recommended system is shown on Exhibit 29.

Table No. 16 summarizes vehicle miles of travel and vehicle hours of travel that could be expected on the recommended network for an average day in the year 1990.

EVALUATION OF THE RECOMMENDED SYSTEM:

The system as recommended will require approximately 15 additional miles of arterial streets, 4 new bridges, 2 additional



LEGEND

RECOMMENDED IMPROVEMENT

1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 20

1990
RECOMMENDED
MAJOR STREET NETWORK

SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS

TABLE NO. 16

SUMMARY OF VEHICLE MILES AND HOURS - 1990 NETWORK

Code	Juris-diction	Local Streets		Arterial		Ramps		Freeways		Totals	
		Veh. Miles	Veh. Hrs.	Veh. Miles	Veh. Hrs.	Veh. Miles	Veh. Hrs.	Veh. Miles	Veh. Hrs.	Miles	Hrs.
0	County	29,689	1,896	91,001	2,733	0	0	0	0	120,690	4,629
1	City	83,934	5,644	281,971	11,701	0	0	0	0	365,905	17,345
2	State Primary City	488	34	405,334	15,171	1,050	63	12,029	219	418,901	15,487
3	State Primary County	0	0	128,029	4,468	5,977	161	49,515	884	183,521	5,513
	Totals	114,113	7,576	906,337	34,074	7,029	225	61,545	1,104	1,089,017	42,974

Total Vehicle Miles = 1,089,017

Total Vehicle Hours = 42,974

Note: Individual column totals may vary slightly because of computer rounding.

traffic lanes for Warden Bridge and substantial improvements to many of the existing facilities. Of the 15 additional miles of arterial streets, 10.2 miles are new routes. The remainder are conversions of existing routes not now on the major street network to one-way couplets. The total program is estimated to cost approximately $19,616,500, or an annual average construction cost of $980,825 per year for the 20-year study period. These estimated costs are based on 1968 dollar values.

After estimated costs were determined, the next step was to estimate the benefits and to determine the benefit-cost ratio. To determine benefits, the basic criteria is the amount of dollar savings to the system user. These savings consist of miles of travel and lesser total travel time on the recommended systems compared to a system without these improvements.

For purposes of this Study, operating cost of each vehicle was set at eight cents per mile and the value of the driver's vehicle time was set at $2.00 per hour.

When projected 1990 traffic was assigned to the existing plus committed system the resultant daily vehicle miles of travel equaled 1,116,379 and vehicle hours of travel equaled 45,036. With projected 1990 traffic assigned to the recommended system vehicle miles of travel dropped to 1,089,017 and vehicle hours of travel dropped to 42,974. Both vehicle miles and vehicle hours are for the average day of the year in estimating total benefits. The following tabulation shows the amount of savings the recommended system will provide on an average day in 1990, if the recommended system is built.

	Vehicle Miles	User Cost at 8¢ Per Mile	Vehicle Hours	Cost at $2	Total Cost
Existing and Committed	1,116,379	$89,310	45,036	$90,072	$179,382
Recommended System	1,089,017	87,121	42,974	85,948	173,069
Difference (Daily Saving)	27,362	$ 2,189	2,062	$ 4,124	$ 6,313

From the above, annual savings in 1990 to the users in operational and time costs will amount to approximately $2,300,000, with the recommended system as compared to a system without improvement.

In addition to operational and time savings the user can also expect to derive benefits in the form of reduced accidents, less starting and stopping, less traffic congestion and a better overall movement of traffic within and through the Study Area. These

additional benefits are hard to evaluate in terms of dollars, but they add to convenience and safety for the highway user.

CHAPTER 12

RECOMMENDATIONS AND COST ESTIMATES

GENERAL:

Traffic capacity analysis of 1990 traffic volume assignments indicate the problem areas in need of improvement. The recommendations of this report are to best serve the transportation needs of the Study Area for the foreseeable future, in the most economical manner.

As stated earlier in the report, a Level "C" Service Volume was used as the basic standard to arrive at a balanced street network. It is not economically possible to attain this level of service on all elements of the system during peak hours. This is particularly true in the Central Business District and on some of the major arterials located in and through areas with limited right-of-way. The recommended system does, however, provide the highest level of service that is considered economically feasible on the major traffic corridors for the Study Area.

RECOMMENDED IMPROVEMENTS TO THE COMMITTED SYSTEM:

1. Replacement of the 10th Street Bridge

As previously discussed in Chapter 11, serious structural deficiencies have been noted in the bridge structure across the Missouri River at 10th Street. These deficiencies were considered to be of such magnitude that replacement of this facility will be required in the near future.

When analyzing current traffic volumes within the 10th and 15th Street corridor, it can be seen that the total present average daily traffic on both the 10th and 15th Street Bridges equals 16,700. The new four-lane structure at 15th Street is capable of handling this total volume and still have considerable excess capacity to adequately handle foreseeable projected volumes for the corridor. It therefore seemed inadvisable to place another major structure in such close proximity. Consequently, an upstream location was considered to be the most practical.

In selection of a tentative site, consideration was given to an acceptable terminal location for the right bank of the Missouri River. The underpass presently located in the vicinity of 6th Street North and 8th Avenue North provided a location where both the Milwaukee and Great Northern Railroad tracks could be underpassed with minimum difficulty. It had the added advantage of providing a direct connection to the existing 5th and 6th Street north and south one-way couplet. It was therefore determined that this point would provide the most desirable location relative to the right bank of the Missouri. On the left bank of the Missouri, a tentative location was selected somewhat north of the intersection of the Northwest By-Pass and U.S. 87 By-Pass in an area where development was at a minimum and

right-of-way costs were considered minimal. A bridge at this location had the decided disadvantage of requiring a relatively long bridge structure (2,300 feet +/-) but did have the advantage of providing a more direct link between the rapidly growing Riverview area and also providing reasonably direct access to the Northwest By-Pass.

When 1990 traffic was assigned to the system with a bridge at this location, the result was a well balanced network with three major corridors connecting the areas north and west of the river to the Central Business District and other points east and south of the river. Projected bridge volumes were as follows:

Central Avenue West	-	18,700 vehicles per day
15th Street	-	18,100 vehicles per day
10th Street Replacement	-	22,800 vehicles per day

Because of the long structure involved, other alternates were considered. With the same terminal point on the right bank, the terminal for the left bank was moved to a point immediately east of the sewage treatment plant connecting to Smelter Avenue at approximately 6th Street Northeast. This location would provide a shorter river crossing, but did not provide the system balance realized with the preceding alignment. It was also noted that with this alignment total vehicle miles and hours of travel were considerably higher.

It is estimated that user savings throughout the design life of the structure would justify the additional cost of the longer structure providing more direct access to the Northwest By-Pass and to the Riverview area. It is recommended, therefore, that a four-lane structure be constructed at the approximate location shown in Exhibit 31. Estimated cost of the facility is $3,500,000, including terminal connections on both banks of the river.

Subsequent in-depth location studies will be required to determine the most economical and efficient terminal point on the left bank of the river. However, the findings of this report would indicate the general area as proposed would be that providing the best service at the lowest user cost throughout the study period.

2. 6th Street Southwest from 10th Avenue South to Central Avenue West

Although this system is in part committed, an area of doubt remains for that portion from the Great Northern Underpass to Central Avenue West. Projected traffic volumes on this portion of the facility range from 20,800 to 23,300 vehicles per day. Such volumes will require a relatively high standard four-lane design. Because no single route exists with adequate right-of-way for such design, this report recommends the provision of a new route across the southwest side from the Underpass to Central Avenue West and

Third Street and, at the same time, the improvement of the existing alignment on 6th Street Southwest from Central Avenue West to the Underpass. Both routes should be of a high-type, two-lane design with a design capacity of 14,000 vehicles per day. Projected volumes for the two routes are 12,800 vehicles per day for 6th Street Southwest, and 10,800 vehicles per day for the diagonal route to 3rd Street.

Based on a location study prepared by the Preconstruction Division of the Montana Highway Commission, the diagonal route, as proposed, would require the purchase of 104 feet of right-of-way at an estimated cost of $262,500, and the displacement of approximately 35 families. Under the recommendations made herein, it is assumed that this cost may be substantially lower and comparable to right-of-way costs if the entire facility were to be located on the present alignment of 6th Street Southwest (approximately $170,000). The residential and commercial property affected by the diagonal route is considerably less substantial than that on 6th Street Southwest.

The recommendation would allow adequate capacity for traffic to move on both routes and relieve congestion at the intersection of 6th Street and Central Avenue West where the east approach is currently operating above design capacity.

Estimated cost of the entire project from the proposed connection at the Interstate Spur, including the Sun River Structure and the Underpass Structure, is as estimated by the Montana Highway Commission, Preconstruction Division, at $2,900,000.

3. Replacement of the Central Avenue West Bridge

The Central Avenue West Bridge currently carries the largest traffic volumes of all bridges within the Study Area. Average daily traffic across this structure totals 19,700 vehicles per day, compared to Warden Bridge, the next most heavily traveled with 13,800 vehicles per day. It serves as a major connecting link between the Central Business District and extensive commercial, industrial, and residential land uses west of the river. Loss of this link would seriously and adversely affect the entire transportation system.

Capacity of the structure is not the problem. Its present four-lane width would carry present and projected traffic volumes throughout the study period. However, recent investigations by the State Bridge Engineer indicate that the structure is now in need of replacement. The situation is similar to the 10th Street Bridge. Both structures were built in 1920 and are now showing signs of advanced deterioration. There can be little doubt that both structures must be replaced in the reasonably near future.

The problems related to reconstruction of the Central Avenue West Bridge are much more critical than those relating to the 10th Street Bridge, primarily because of relatively high traffic volumes that must be handled during the construction phase. For example, if the recommended replacement for the 10th Street Bridge is built at the proposed location, it would not affect traffic now using the 10th Street structure. During construction of the

replacement, traffic could continue to use the 10th Street Bridge, at least to a limited degree, unless further deterioration would result in complete closure. Even with the bridge closed to traffic, relief could be gained at 15th Street with relatively little inconvenience to the traveling public. This would also be the case in the event subsequent site location studies would indicate some location other than that proposed, even reconstruction of 10th Street at its present location. This is not true for the Central Avenue West Bridge. It should be reconstructed at its present location and in order to do so, it is mandatory that an alternate route be available during construction to handle the high volumes of traffic.

For these reasons, it is recommended that the Central Avenue West Bridge reconstruction be scheduled immediately following construction of the 10th Street replacement. The estimated cost of reconstructing the Central Avenue West Bridge in its present location is $1,650,000. This cost does not include a grade separation between Central Avenue West and the Great Northern tracks on the west bank of the Missouri. The costs of such a grade separation would be extremely high and at this point would not seem justified. A grade separation should be given further consideration at the time of the final planning of the new structure.

With the knowledge that this bridge is in poor structural condition, it will be necessary to maintain constant observation of it, and provide repairs or reinforcement as necessary to insure the safety of traffic using the bridge until it can be reconstructed.

4. Warden Bridge and 10th Avenue South

The present two-lane structure was carrying 13,800 vehicles per day in 1968. The design capacity of the structure is approximately 12,000 vehicles per day. Projected traffic volumes indicate that with the recommended system this bridge will be expected to carry volumes approaching 24,000 vehicles per day by 1990. This volume will require an additional two-lane structure parallel to the existing bridge and should be constructed prior to 1975. The estimated cost is $2,300,000.

Tenth Avenue South, by 1990, will be carrying volumes ranging up to 36,000 vehicles per day on the recommended system. This will require an additional two lanes of traffic and it is recommended that the arterial street be restriped to accommodate the additional two lanes. This will provide three lanes of traffic in each direction and will do so within the existing paved roadway. Although the driving lanes will be less than the desired 12 feet for major arterial streets, it is felt that the six lanes will operate within tolerable limits without the expense of major reconstruction. It is further recommended that every effort be made to relocate the existing light fixtures from the median to outside the curbed area and remove all other encroachments from the right-of-way. Lighting intensity should be increased to a uniform five-foot candles at the center line along the entire route from 2nd to 57th Streets. Lighting improvements will be necessary for the facility to operate effectively as a six-lane

arterial with maximum 11-foot driving lanes. The estimated cost is $15,000 for restriping and $145,000 for relighting.

These improvements should be scheduled prior to 1975.

5. 2nd and 3rd Street One-Way Couplet and the 2nd Street Grade Separation

To provide better access to the Central Business District from 10th Avenue South, this couplet is recommended. Projected traffic volumes for the corridor, including the existing 5th and 6th Street Couplet, amount to 25,100 vehicles per day which is in excess of the capacity of 5th and 6th Streets. Adding this couplet will relieve the 5th and 6th Street Couplet and will also prevent excessive loading of 2nd Street from 1st Avenue South to 10th Avenue South. The couplet would connect to 10th Avenue South and be incorporated in the proposed grade separation. For the best design, it is recommended that the Milwaukee spur track located in 10th Alley South be abandoned. Officials of the Milwaukee Railroad indicate this spur could be eliminated with adverse effect on only two customers. The estimated cost is $250,000.

6. Emerson Junction Interchange

It is recommended that two additional ramps be constructed at Emerson Junction. Traffic projections indicate that 333 vehicles per day would utilize the additional southbound access and 555 vehicles per day would utilize the northbound egress at this point. It is assumed in making this recommendation that actual use of the interchange may well exceed these projections because of factors other than travel time, which was the major basis of the traffic assignment. For instance, it is anticipated that major use of the additional ramps will be by heavy commercial vehicles serving the industrial areas along U.S. 89, the Northwest By-Pass, and other industrial areas projected for future development. A distinct advantage would be realized in diverting heavy truck traffic from other sections of the network. A small increase in travel time for heavy commercial vehicles would be warranted in such a case and they could be routed to this interchange as opposed to Central Avenue West or some other route.

The recommended geometrics of the interchange are a part clover-leaf confined entirely north of U.S. 89. The estimated cost is $185,000, including revision of existing ramps and the two new ramps. It is assumed that adequate right-of-way is now under State ownership to accommodate the necessary construction.

7. South By-Pass from Gore Hill to 57th Street

Without the relief that this recommended route will provide, 10th Avenue South and Warden Bridge would be totally unable to handle projected volumes in 1990. Traffic assignments show that the recommended route will be carrying volumes ranging from 8,700 to 22,600 vehicles per day in 1990, a majority of which would be assigned to 10th Avenue South if this facility is not

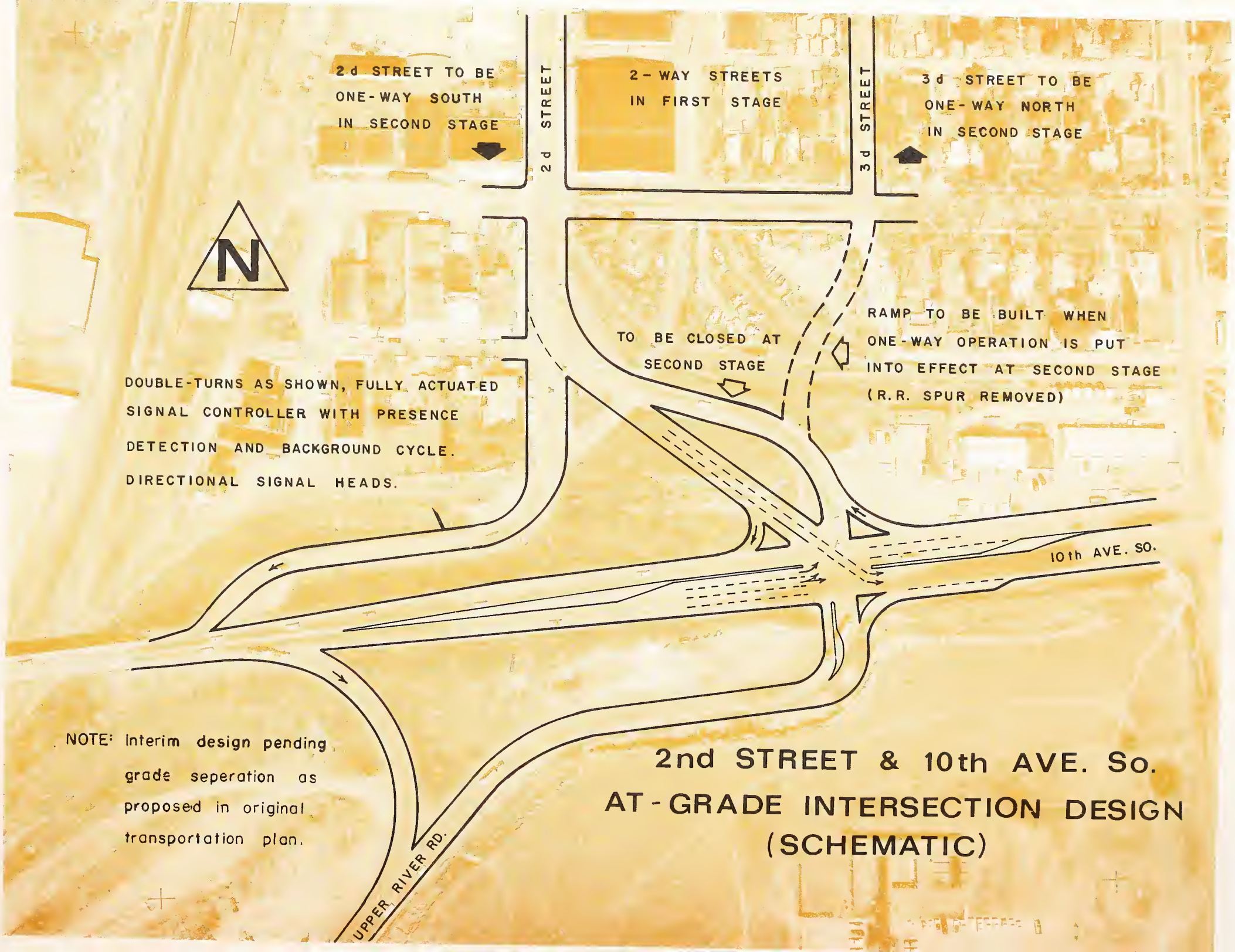

2d STREET TO BE ONE-WAY SOUTH IN SECOND STAGE
2d STREET
2-WAY STREETS IN FIRST STAGE
3d STREET
3d STREET TO BE ONE-WAY NORTH IN SECOND STAGE
N
TO BE CLOSED AT SECOND STAGE
RAMP TO BE BUILT WHEN ONE-WAY OPERATION IS PUT INTO EFFECT AT SECOND STAGE (R.R. SPUR REMOVED)
DOUBLE-TURNS AS SHOWN, FULLY ACTUATED SIGNAL CONTROLLER WITH PRESENCE DETECTION AND BACKGROUND CYCLE. DIRECTIONAL SIGNAL HEADS.
10th AVE. SO.
UPPER RIVER RD.
NOTE: Interim design pending grade seperation as proposed in original transportation plan.
2nd STREET & 10th AVE. So.
AT-GRADE INTERSECTION DESIGN
(SCHEMATIC)

EXHIBIT NO. 30

constructed. It will serve the areas south of the City which are expected to grow rapidly within the study period, especially west of the Missouri River.

As recommended, the route will include a new four-lane bridge across the Missouri River between Park and Taylor Islands and two structures over the Great Northern Mainline Tracks. It should be designed as a limited access four-lane divided facility with possible future grade separations at points of intersection with other major arterials.

It is proposed that the entire project be programed as stage construction with two lanes initially provided within a pre-acquired right-of-way width of 120 feet minimum proposed in residential or commercial areas and 200 feet minimum at locations of possible future grade separations. Frontage roads on either side will provide service to abutting property and will be provided as determined by area development. Frontage roads are not included as part of the proposed route construction. Total cost of this facility is estimated at $4,500,000.

8. Airport Access

As discussed in Chapter 11, the recommended airport access will be via Central Avenue West to approximately 24th Street Southwest, and thence south across the Sun River to the proposed new terminal site on Gore Hill. Maximum projected traffic volumes along this route will be approximately 18,000 vehicles per day at the Central Avenue West Bridge. Volumes in this range will be experienced on Central Avenue West to its connection with Interstate 15 at the Central Avenue Interchange. West of the interchange volumes decrease to 14,000 vehicles per day and subsequently decrease to 8,550 vehicles per day on that portion of the route confined primarily to airport traffic. It is recommended, therefore, that the route be improved from Central Avenue West and 20th Street to the airport boundary to a high-type, two-lane arterial standard. The remainder of the route will adequately handle projected traffic volumes within an acceptable level of service. Estimated cost is $628,000 (assuming no abnormal problems in construction will be encountered in that portion of the route up the north slope of Gore Hill).

The foregoing eight recommendations are those made in addition to the recommendations of the 1961 Transportation Study which are hereby included in the over-all Transportation Plan Update. The total 20-year recommended program is summarized in Table No. 17 in five-year priority periods, commencing with calendar year 1970.

ESTABLISHING PRIORITIES:

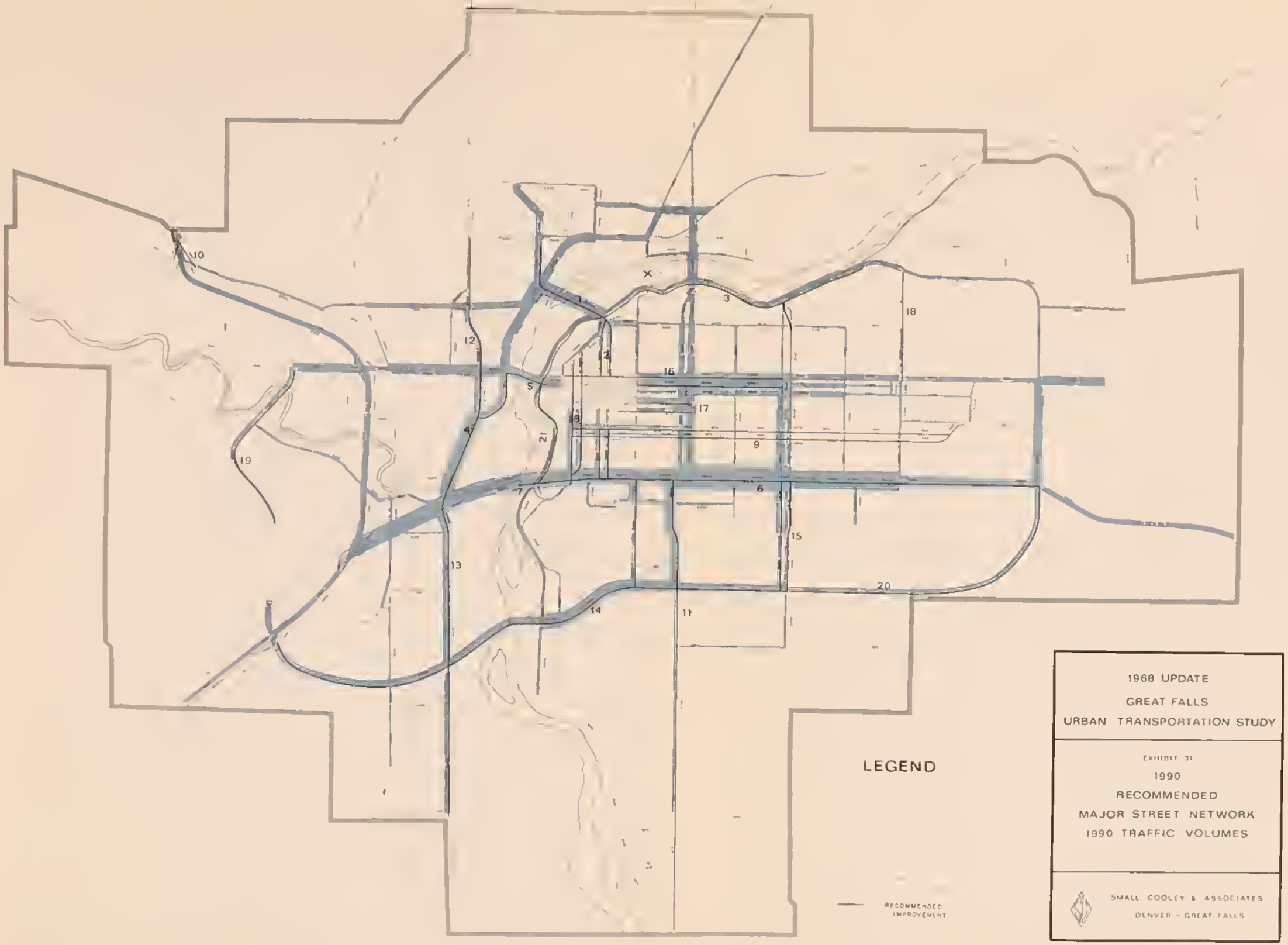
The serious structural condition of the two major bridges was not known until the later stages of the Transportation Study Update. Because of the safety factor, their high cost and extreme importance in the transportation system, these two facilities require a major revision in the earlier proposed priorities for improvements.

To gain factual information for first stage planning and in the establishment of priorities, an interim traffic assignment was made to the year 1975. This assignment pointed out the need for improvements elsewhere on the major street network in the relative near future, particularly on 10th Avenue South and on the Warden Bridge. 1975 average daily volumes for Warden Bridge were projected to be nearly 25,000 vehicles per day. Between 2nd Street and 26th Street on 10th Avenue South, projected volumes for the year 1975 ranged from 25,000 vehicles per day immediately east of 2nd Street, to 34,100 vehicles per day between 20th and 26th Streets. Since present traffic is already in excess of the desired service volumes on the bridge and in some areas on 10th Avenue South, improvements along this major corridor must also be considered a high-priority item.

The 1975 assignment also indicated the need for improvements on 6th Street Southwest from U.S. 91 to Central Avenue West. Projected traffic volumes for 1975 range from 12,800 to 14,500 for this facility. The project is in the final planning stage and is scheduled for completion prior to 1975.

There is serious doubt whether funds will be available to accomplish all of the high-cost items within the time period as set forth in the recommended schedule of improvements as summarized in Table No. 17. However, it should be pointed out that much of today's problem arises from past deferrals of action on needed improvements. Since inflation increases costs, and the improvements cannot be perpetually deferred, it is recommended that all levels of government involved exert every effort to obtain the necessary funds to complete the program as outlined.

The total 20-year system cost of $19,616,500 includes funds for two committed projects which are included in the State Highway Commission's five-year construction program for the Great Falls area. The State Highway Commission has earmarked funds for their construction; however, Federal funds have not as yet been guaranteed. These projects are: 6th Street Southwest from U.S. 91 to Central Avenue West, and 13th Street South from 10th Avenue South to the South Study Area Boundary. Both are programed for construction in 1971 or 1972. All other committed projects have been funded, are now under construction, or will be under construction in 1970 and are not included in the above total.



LEGEND

RECOMMENDED IMPROVEMENT

1968 UPDATE
GREAT FALLS
URBAN TRANSPORTATION STUDY

EXHIBIT 31
1990
RECOMMENDED
MAJOR STREET NETWORK
1990 TRAFFIC VOLUMES

SMALL COOLEY & ASSOCIATES
DENVER - GREAT FALLS

TABLE NO. 17

GREAT FALLS URBAN TRANSPORTATION STUDY
RECOMMENDED IMPROVEMENTS - MAJOR STREET SYSTEM
1970 - 1990

NO	PRIORITY PERIOD ONE (1970-1975) PROJECT	FROM	TO	PROJECT DESCRIPTION	COSTS STATE & FED.	COSTS LOCAL	NO. OF LANES	REMARKS
1	10th Street Bridge Replacement	West bank of Missouri River	East bank of Missouri River	Construct new 4-lane bridge	$ 3,500,000		4	Proposed location subject to comprehensive site location study.
2	5th & 6th Street Couplet	8th Ave. N.	10th Ave. S.	Widen and improve to min. 50' paved roadway (remove boulevards)		$322,000	6	Related to Item No. 1
3	River Drive	6th Street	Giant Springs Road	Reconstruct to high standard 2-lane roadway. To include realignment and new structure over G.N.R.R. east of 10th St.	1/ 600,000	50,000	2	Related to Item No. 1
4	6th St. S.W.	U.S. 91	Central Ave. West	Reconstruct bridge and entire route to 4-lane divided roadway	1/ 2,840,000	60,000	4	Committed for construction
5	Central Ave. West Bridge	West bank of Missouri River	East bank of Missouri River	Reconstruct 4-lane bridge in present location	1,650,000		4	Construction to follow Item No. 1
6	10th Ave. S.	2nd Street	57th Street	Restripe for 6 lanes, relight entire route and clear right-of-way	15,000	145,000	6	Lighting relocation and increased intensity required for 6 lanes
7	Warden Bridge	West bank of Missouri River	East bank of Missouri River	Construct additional 2-lane bridge	2,300,000		2	Four lanes required to carry 1975 estimated ADT
			PRIORITY PERIOD ONE COSTS		$10,905,000	$577,000		

NO.	PROJECT	FROM	TO	PROJECT DESCRIPTION	COSTS STATE & FED.	COSTS LOCAL	NO. OF LANES	REMARKS
	PRIORITY PERIOD TWO (1975-1980)							
8	2nd & 3rd Street	Park Drive	10th Ave. S.	Convert to one-way couplet and construct grade separation at 2nd St.	$ 200,000	$ 50,000	6	To be constructed following Item No. 7
9	4th & 5th Ave. S.	2nd Street	46th Street	Convert to one-way couplet, signs and signals	3/ 40,000	45,000	4	Within present roadway, inc. possible parking restrictions
10	Emerson Junction	(Interchange Revision)		Add 2 ramps to complete interchange	185,000	-	2	Convert existing half-diamond to part cloverleaf
11	13th St. South	10th Ave. S.	South Study Area Boundary	Reconstruct to 2-lane standard	400,000	-	2	Programed by Cascade County Commissioners as a FAS Priority - in planning stage
12	6th St. N.W.	Central Ave. West	Smelter Ave.	Reconstruct 4 lanes, Central Ave. West to Northwest By-Pass. Reconstruct 2 lanes, Northwest By-Pass to Smelter Ave.		193,500	2 & 4	Central to By-Pass - 4, 12' driving lanes, 2, 10' parking lanes By-Pass to Smelter, 2, 12' driving lanes, 2, 10' parking lanes
			PRIORITY PERIOD TWO COSTS		$825,000	$288,500		
	PRIORITY PERIOD THREE (1980-1985)							
13	Fox Farm Road	U.S. 91 (10th Ave. S.)	South Study Area Boundary	Reconstruct 4 lanes from U.S. 91 to Park Garden Road to South Study Area Boundary		293,000	4	This project being planned by City of Great Falls and may be constructed in earlier priority period
14	South By-Pass (Phase One)	Fox Farm Rd.	26th Street	Construct two lanes of ultimate 4-lane limited access facility. Pre-purchase of entire right-of-way this phase. Build one railroad overpass	2/ 1,700,000		2	This project recommended for stage construction. Phase Two to follow as land development occurs and volumes on 10th Ave. S. and Warden Bridge dictate

NO.	PROJECT	FROM	TO	PROJECT DESCRIPTION	COSTS STATE & FED.	COSTS LOCAL	NO. OF LANES	
	PRIORITY PERIOD THREE (CONTINUED)							
15	25th & 26th Streets (one-way couplet)	10th Ave. S.	24th Ave. S.	Extend one-way couplet to connect to South By-Pass		244,000	4	One-mile reconstruction on 26th St. 0.8-mile new construction, 25th St. Related to Item No. 13.
16	1st & 2nd Ave. N. (one-way couplet)	Park Drive	25th Street	Widen and improve to min. 50' roadway each avenue. Remove boulevards and correct drainage.	1/ 434,000	100,000	6	Three lanes of traffic @ 11' and 2 lanes of parking @ 8.5' each avenue.
17	1st & 2nd Ave. S. (one-way couplet)	Park Drive	15th Street	Same as Item No. 16		205,000	6	Same as Item No. 16
18	38th Street	2nd Ave. N.	U.S. 87 By-Pass	Construct 2 lanes and parking		117,000	2	Two traffic lanes @ 12', 2 parking lanes @ 10'.
19	Airport access to new terminal site	Central Ave. W. & 20th St.	Gore Hill - new terminal site	Construct 2 lanes on 27th St. S.W. from Central Ave. W.-Sun River - new 2-lane bridge across Sun River and 2 lanes to new terminal site. Reconstruct 2 lanes Central Ave. W.-20th St. to 27th St.	2/ 558,000	70,000	2	Projected volumes indicate 2 lanes will be adequate throughout study period.
			PRIORITY PERIOD THREE COSTS		$2,692,000	$1,029,000		
	PRIORITY PERIOD FOUR (1985-1990)							
20	Complete South By-Pass	Gore Hill-Airport Interchange	10th Ave. S. & 57th St.	Complete 4-lane limited access facility within pre-acquired right-of-way. Add 2 lanes to river crossing. Add 2 lanes to R.R.Overpass. Construct 1 new 4-lane R.R. Overpass	2/ 2,800,000	-	4	It is assumed that the 4 lanes will be required during this priority period.
21	River Drive	6th Street	10th Ave. S.	Reconstruct to 2 lanes and reconstruct 2 underpasses	500,000	-	2	Underpass at Central Ave. W. Bridge to be considered in plans for Item No. 5.
			PRIORITY PERIOD FOUR COSTS		$3,300,000	-		

COST SUMMARY	COSTS STATE & FED.	COSTS LOCAL
PRIORITY PERIOD ONE	$ 10,905,000	$ 577,000
PRIORITY PERIOD TWO	825,000	288,500
PRIORITY PERIOD THREE	2,692,000	1,029,000
PRIORITY PERIOD FOUR	3,300,000	-
TOTAL 20-YEAR COST	$ 17,722,000	$ 1,894,500
TOTAL 20-YEAR COST - ALL SOURCES	$ 19,616,500	

Several projects were recommended in the 1961 Study that are not listed in these recommendations for a variety of reasons. The projects and reasons why they are not included are:

1. 14th Street Bridge Replacement. The Flood Control Project will require the removal of this bridge. The Interstate 15 bridge and the new bridge at 27th Street Southwest provide the needed service.
2. Lower Sun River Road from West Hill Addition to U.S. 91. Some work has been done on this project. The additional needed work will be accomplished as future development occurs.
3. Park Drive and 1st Avenue North Intersection Revision. This project will be contracted in 1970, and is considered committed to the system.
4. Ninth Street, 8th Avenue North to 10th Avenue South. The parking restriction recommended in the 1961 Study is still valid, but this is a minor cost item requiring no construction.
5. 4th Street, 10th Avenue South to 24th Avenue South. This section is replaced with 9th Street connection to the proposed South By-Pass.

Three other projects are recommended on the 1990 System, but are not included on the list. They are:

1. 13th Avenue South, 4th to 7th Street. This is a minor project to be constructed by a Special Improvement District.
2. Division Road, Smelter Avenue to U.S. 87 By-Pass. This is under construction by the City in 1969-1970.
3. 9th Street South, 20th Avenue South to the proposed South By-Pass. Four blocks are to be surfaced by the City from 20th Avenue South to the proposed South By-Pass under normal development.

1/ Local costs to cover proportionate share of curb, gutter, utility revision and drainage.
2/ Not on present Federal Aid System, but construction predicated on Federal Aid designation prior to construction.
3/ This couplet is not on a Federal Aid System. However, Federal and State costs are for signal system installation at intersecting Federal-Aid routes or proposed Federal-Aid routes (5th, 6th, 14th and 15th Streets). It is assumed that 5th and 6th Streets will be designated as primary Type II under the TOPICS Program and will therefore be eligible for Federal and State Aid for signal installation.

1990 RECOMMENDED NETWORK
GREAT FALLS URBAN AREA

— MAJOR STREET NETWORK
— RECOMMENDED IMPROVEMENTS
0 PROJECT NUMBER

THE OPINIONS, FINDINGS AND CONCLUSIONS EXPRESSED IN THIS PUBLICATION ARE THOSE OF THE AUTHORS AND NOT NECESSARILY THOSE OF THE DEPARTMENT OF PUBLIC

Summary Report — Great Falls Area

TRANSPORTATION PLAN UPDATE

FOR The Montana Highway Commission Planning Survey Section

The City of Great Falls

and

The Great Falls City-County Planning Board

IN COOPERATION WITH:

The U.S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads

BY: Small, Cooley and Associates
Denver and Great Falls

James M. Small, Study Director
C. R. Hanson
Donald R. Douglas
R. Byron Roberts
Wayne E. Monson

INTRODUCTION:

This is Great Falls - a growing community of over 78,000 people that has doubled since World War II and is expected to grow to over 120,000 by 1990!

Fortunately, Great Falls began with a plan - when in 1883 Paris Gibson platted the townsite at a scenic location blessed with water, power and natural resources.

Now the trade center for a vast and rich agricultural area, Great Falls boasts an international airport, the Anaconda Company, Malmstrom Air Force Base, flour mills, an oil refinery, meat packing plants, two major railroads, bakeries, feed plants, concrete product plants, iron works and numerous other producers. Because of the abundance of resources, power and transportation facilities, it is an area in which industry can flourish.

Our people today are buying more automobiles, shipping more goods, and going more places than ever before - truly a society on the move. The Great Falls urban area now contains over 30,000 vehicles which make over 212,000 trips daily, totaling over 587,000 miles every 24 hours - the distance to the moon and back.

By 1990 it is expected that the population of over 120,000 persons will own 50,000 automobiles and travel more than one million vehicle-miles per average day.

TRANSPORTATION PLANNING:

With growing traffic volumes have come the problems of congestion, regulating existing traffic, and the need to provide facilities which will carry tomorrow's increased number of vehicles. Planning must be accomplished today so that tomorrow's streets, bridges, and other facilities will provide the most efficient response to increased demands, and this planning must be accomplished in such a way as to enhance the physical quality of the Great Falls area. It has been with this goal in mind that the Montana Highway Commission, Planning Survey Division, in cooperation with the U. S. Department of Transportation, Bureau of Public Roads, and the Great Falls City-County Planning Board established in 1961 a continuing process of transportation planning as part of a total planning program within the Great Falls area.

As a continuing process, a system of on-going review has been incorporated into this plan. It is for this reason that an in-depth update of the 1961 Urban Transportation Study was recently conducted, beginning in July, 1967.

In this Update Study, ten separate areas were researched:

1. Economic factors affecting community development;
2. Population;
3. Land Use;
4. Transportation facilities;
5. Travel patterns;
6. Terminal facilities for parking;
7. Traffic control features;
8. Zoning ordinances, subdivision regulations;
9. Financial resources; and
10. Social and community-value factors such as parks and recreational facilities - preservation of historical sites and aesthetics.

In consideration of these ten items, the transportation process recognizes the fundamental association with other elements of comprehensive community planning. Transportation facilities in the Great Falls area cannot be divorced from other inter-related elements such as housing, commercial development, industrial development, open spaces and utilities.

Emphasis was placed upon the close relationship between roadways and land use in the Great Falls Transportation Plan. Socio-economic studies, land use and population projections, and the future overall plan for the community were all prepared by the City-County Planning Board. These plans formed the basis for projected traffic demands for 1975 and 1990. Close coordination was maintained between the Consultant and the Planning Board Staff during the preparation of both the future land use plans and the future roadway plans.

DEFINITION OF TERMS:

ZONES: Divisions of the study area for the purpose of trip analysis and route assignment.

EXTERNAL SURVEY: A survey of traffic entering and leaving the study area.

INTERNAL SURVEY: A survey of a preselected number of dwelling units, taxi cab operators, and truck operators for the purpose of obtaining travel information for trips beginning and ending within the study area.

SCREENLINE: A line which traverses the study area having a restricted number of crossing points which can be accurately checked to determine total traffic moving from one part of the study area to another. In this study the screenline was the Missouri River.

LINK: A section of the street network between two well defined points.

TRAFFIC CAPACITY: The total number of vehicles that can be accommodated on a section of the network during a specified time period under a given set of conditions.

FREE FLOW CAPACITY: The total number of vehicles that can be accommodated on a section of the network under optimum conditions while maintaining uninterrupted flow.

INTERNAL TRIP: A trip having both the origin and destination within the study area.

EXTERNAL TRIP: A trip having either the origin or the destination outside the study area.

THE TRANSPORTATION SURVEY:

In the Update Study, a study area was first selected, in cooperation with the City-County Planning Board, that encompassed all land expected to be part of the Great Falls urbanized area by the year 1990. This area was extended from the 1961 Study Area and encompassed approximately 55 square miles. A major street network was then selected for study. These streets represented only about 30 percent of all the streets within the Study Area, but they carried about 90 percent of all traffic.

The entire Study Area was divided into zones, and extensive facts were gathered about each zone by the Great Falls City-County Planning Board. These facts were projected to 1975 and 1990 and formed the basis for future traffic projections to these target years.

A home interview survey was conducted to determine the current travel characteristics of the residents within the Study Area. One in 20, or 5 percent, of the dwelling units within the Study Area, were contacted by telephone and asked a series of questions relative to their travel habits. Comparisons between current and base-year (1961) travel characteristics were then made. The sampling was increased to 1 in 5, or 20 percent, of all dwelling units in the expanded Study Area. In addition to the home-interview survey, a roadside external survey was conducted. Roadside interviews were conducted at nine external stations which represented about 96 percent of all external traffic, and travel data were collected from all out-bound traffic at these points.

In addition to the home-interview survey and the external survey, an extensive series of traffic counts was taken on all major sections of the major street network. Travel data obtained from the home interview and external surveys were factored and compared to traffic volumes counted at screen-line locations for checking purposes. A taxi survey involved a 100 percent sampling of all taxi travel within the Study Area for an average day. In 1961 an extensive truck survey was conducted and this information was factored to represent 1968 truck travel. Also, on-street and off-street parking supply and demand were studied in the Central Business District and along 10th Avenue South - the two major areas of commercial activity.

Average driving speeds were computed for each link of the network by timing vehicles between established control points during peak-hour and off peak-hour conditions. Speeds in the Central Business District averaged less than ten miles per hour and peak-hour speeds on 1st Avenue North averaged about five miles per hour. A complete signal system analysis was also conducted in order to determine the traffic capacity at each signalized intersection and to make recommendations for increasing this capacity.

A comprehensive search of accident reports of the City Police Department and Montana Highway Patrol was made in 1967. Each accident occurring on the major street network for the three-year period from 1965 through 1967 was investigated. Statistics as to location, cause and severity were recorded and subsequently analyzed.

The intersection having the highest number of accidents was 10th Avenue South at 9th Street. Seventy-five accidents occurred at this location between 1965 and 1967. Central Avenue West and 3rd Street ranked second with 69 accidents for the same period of time. The most serious accident area was on 10th Avenue South from Warden Bridge to 57th Street. This area included four of the top ten accident intersections and accounted for 16.3 percent of all accidents on the major street network.

RESULTS OF THE TRANSPORTATION SURVEY:

After all the data were collected and coded, they were processed by large high-speed computers and the results were tabulated. The following table gives an overall comparison of some of the travel data for 1961 and 1968.

1961 to 1968 COMPARISONS OF SELECTED TRAVEL INFORMATION

Description	1961	1968	% Change From 1961
Total Internal Auto Driver Trips	109,689	170,645	+55.6%
Internal Auto Driver Trips Attracted to Central Business District	18,687	30,890	+65.3%
% of Auto Driver Trips Attracted to Central Business District	17.0%	18.1%	+ 1.1%
Bridge Traffic			
Warden Bridge	11,400	13,800	+21.1%
Central Avenue West Bridge	18,900	19,700	+ 4.2%
10th Street Bridge	10,400	7,000	—32.7%
15th Street Bridge	—	9,700	—
Total 10th and 15th Corridor	10,400	16,700	+60.6%
Total Crossings	40,700	50,200	+23.3%
External Traffic			
All Stations - All Vehicles	20,716	19,184*	— 7.4%
Through Traffic	932	1,138	+22.1%
Through Traffic, Percent of External	4.5%	5.9%	+ 1.4%

* Decrease because of cordon relocation.

The next step was to assign the estimated future traffic demands of the Study Area to the existing street system as well as this system plus the improvements committed to it. Existing and expected future problem areas were next studied and several "study systems" of major streets, committed improvements and other needed improvements were prepared. Through the use of the high-speed computer, 1975 and 1990 traffic volumes were then assigned to those systems.

For example, daily two-way traffic over Warden Bridge in 1968 totaled about 14,000 vehicles. The free-flowing design capacity of the bridge is about 12,000 vehicles. Under expected 1990 conditions, a demand of 48,000 vehicles per day would be present! An additional two-lane bridge at this location, and another bridge further south along the Missouri River were recommended to handle the future demands by 1990.

This same process was used to evaluate each section of the entire street system. A system of streets and bridges capable of handling traffic adequately to the year 1990 in the most efficient manner was recommended. This updated network incorporated many of the recommendations of the 1961 Transportation Study and also includes major additions and revisions not recommended in the earlier study.

RECOMMENDATIONS:

It was learned in the later stages of the Transportation Study Update that serious structural deficiencies were noted in two of the bridges crossing the Missouri River - the 10th Street Structure and the Central Avenue West Bridge. It was recommended that the 10th Street Structure be relocated upstream to a point that will better serve the overall traffic pattern. It was also recommended that the Central Avenue West Bridge be reconstructed at its present location following the reconstruction of the other bridge.

Another major recommendation was that a new route be established south of 10th Avenue South eventually extending from the Airport Interchange on Interstate 15 atop Gore Hill to the intersection of 10th Avenue South and 57th Street. As recommended, this route will cross the Missouri River at the narrows between Park and Taylor Island with a new four-lane bridge and will proceed east at about 24th Avenue South. It will be designed as a limited-access, four-lane, divided roadway with points of intersection only with major arterials.

The design capacity of the two-lane Warden Bridge presently crossing the Missouri at 10th Avenue South is approximately 12,000 vehicles per day. Projected traffic volumes indicate that this structure must carry 24,000 vehicles per day even with the Southwest By-Pass and bridge in operation. The recommended additional two-lane structure parallel to the existing bridge was also recommended in the 1961 Study.

The 1961 Transportation Study recommendation to restripe 10th Avenue South to six lanes was reaffirmed by the Update Study. It was recommended that 4th and 5th Avenues South be converted to one-way streets to further relieve expected traffic on 10th Avenue South.

Another recommendation made by the 1961 Transportation Study, and which has already been committed in part, is the improvement of 6th Street Southwest from 10th Avenue South to Central Avenue West, including a new bridge over the Sun River.

In conjunction with the improvement of 6th Street Southwest, it has also been recommended that 6th Street Northwest be widened and improved from Central Avenue West north to Smelter Avenue.

Presently the Interstate Highway Interchange at Emerson Junction, northwest of Great Falls, consists of only two ramps - one for outgoing northbound traffic and one for incoming southbound traffic. It is recommended that an additional two ramps be provided at this location to allow full access to the Interstate System.

By 1990, projected traffic generated by the Great Falls International Airport will be such that additional access will be required. Present Airport plans call for relocation of the terminal complex west and north of its present location to an area that can best be served by access from the north. It was recommended that additional airport access be provided via Central Avenue West with a new two-lane road from Central Avenue West at 27th Street south across the Sun River and up the north slope of Gore Hill to the proposed terminal site.

Due to heavy residential growth predicted for the area south of 10th Avenue South along Fox Farm Road, it was recommended that Fox Farm Road be expanded to four lanes from 10th Avenue South to Park Garden Road.

To provide better access to the Central Business District from 10th Avenue South, a one-way couplet at 2nd and 3rd Streets and intersection revision at 2nd Street and 10th Avenue South was recommended.

A complete priority listing of the Update Study recommendations, along with estimated costs, follows:

SUMMARY OF RECOMMENDATIONS AND COSTS

NO.	PROJECT	FROM	TO	COSTS STATE & FED.	COSTS LOCAL
Priority Period One (1970-1975)					
1	10th Street Bridge Replacement	West Bank of Missouri Riv.	East Bank of Missouri Riv.	$ 3,500,000	
2	5th & 6th Street Couplet	8th Ave. N.	10th Ave. S.		$ 322,000
3	River Drive	6th Street	Giant Springs Road	600,000	50,000
4	6th St. S.W.	U.S. 91	Central Ave. West	2,840,000	60,000
5	Central Ave. W. Bridge	West Bank of Missouri Riv.	East Bank of Missouri Riv.	1,650,000	
6	10th Ave. S.	2nd Street	57th Street	15,000	145,000
7	Warden Bridge	West Bank of Missouri Riv.	East Bank of Missouri Riv.	2,300,000	
	PRIORITY PERIOD ONE COSTS			$10,905,000	$ 577,000
Priority Period Two (1975-1980)					
8	2nd & 3rd Street	Park Drive	10th Ave. S.	200,000	50,000
9	4th & 5th Ave. S.	2nd Street	46th Street	40,000	45,000
10	Emerson Junction	(Interchange Rev)		185,000	
11	13th Street S.	10th Ave. S.	South Study Area Bound.	400,000	
12	6th St. N.W.	Central Ave. West	Smelter Ave.		193,500
	PRIORITY PERIOD TWO COSTS			$ 825,000	$ 288,500
Priority Period Three (1980-1985)					
13	Fox Farm Road	U.S. 91 (10th Ave. S.)	South Study Area Bound.		$ 293,000
14	South By-Pass (Phase One)	Fox Farm Road	26th Street	$ 1,700,000	
15	25th & 26th Streets (one-way couplet)	10th Ave. S.	24th Ave. S.		244,000
16	1st & 2nd Ave. N. (one-way couplet)	Park Drive	25th Street	434,000	100,000
17	1st & 2nd Ave. S. (one-way) couplet)	Park Drive	15th Street		205,000
18	38th Street	2nd Ave. N.	U.S. 87 By-Pass		117,000
19	Airport Access to new terminal site	Central Ave. W. & 20th St.	Gore Hill—new terminal site	558,000	70,000
	PRIORITY PERIOD THREE COSTS			$ 2,692,000	$ 1,029,000
Priority Period Four (1985-1990)					
20	Complete South By-Pass	Gore Hill-Airport Interchange	10th Ave. S. & 57th St.	2,800,000	
21	River Drive	6th Street	10th Ave. S.	500,000	
	PRIORITY PERIOD FOUR COSTS			$ 3,300,000	
	TOTAL 20-YEAR COST			$17,722,000	$ 1,894,500
	* TOTAL 20-YEAR COST—ALL SOURCES			$19,616,500	

* Committed projects $3,300,000
Not committed projects $16,316,500